WORK PLAN

FOR

WATERSHED PROTECTION, AGRICULTURAL WATER MANAGEMENT AND RECREATION

BAYOU BOEUF WATERSHED

RAPIDES PARISH, LOUISIANA

APRIL 1965

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WATERSHED WORK PLAN AGREEMENT

between the

RAPIDES PARISH POLICE JURY
(Local Organization)

LOWER WEST RED RIVER SOIL AND WATER CONSERVATION DISTRICT
(Local Organization)

State of Louisiana
(hereinafter referred to as the Sponsoring Local Organizations)

and the

Soil Conservation Service
United States Department of Agriculture
(hereinafter referred to as the Service)

Whereas, application has heretofore been made to the Secretary of Agriculture by the Sponsoring Local Organizations for assistance in preparing a plan for works of improvement for the Bayou Boeuf Watershed, State of Louisiana, under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress; 68 Stat. 666) as amended; and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to the Service; and

Whereas, there has been developed through the cooperative efforts of the Sponsoring Local Organizations and the Service a mutually satisfactory plan for works of improvement for the Bayou Boeuf Watershed, State of Louisiana, hereinafter referred to as the watershed work plan, which plan is annexed to and made a part of this agreement;

Now, therefore, in view of the foregoing considerations, the Sponsoring Local Organizations and the Secretary of Agriculture, through the Service, hereby agree on the watershed work plan, and further agree that the works of improvement as set forth in said plan can be installed in about ten years.

It is mutually agreed that in installing and operating and maintaining the works of improvement substantially in accordance with the terms, conditions, and stipulations provided for in the watershed work plan:

1. The Rapides Parish Police Jury will acquire without cost to the Federal Government such land, easements, or rights-of-way as will be needed in connection with the works of improvement. (Estimated Cost $417,203.)

2. The Sponsoring Local Organizations will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to State Law as may be needed in the installation and operation of the works of improvement.

3. The percentages of construction costs of structural measures to be paid by the Rapides Parish Police Jury and by the Service are as follows:

Works of Improvement	Rapides Parish Police Jury (percent)	Service (percent)	Estimated Construction Cost (dollars)
All	50	50	3,869,320

4. The percentages of the cost for installation services to be borne by the Rapides Parish Police Jury and the Service are as follows:

Works of Improvement	Rapides Parish Police Jury (percent)	Service (percent)	Estimated Installation Service Cost (dollars)
Water Resource Facilities	0	100	1,170,829
Minimum Basic Facilities	50	50	95,106

5. The Rapides Parish Police Jury will bear the costs of project promotion and contract administration. (Estimated Cost $64,000.)

6. The Lower West Red River Soil and Water Conservation District will obtain agreements from owners of not less than 50 percent of the land above each reservoir that they will carry out conservation farm or ranch plans on their land.

7. The Lower West Red River Soil and Water Conservation District will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the watershed work plan.

8. The Sponsoring Local Organizations will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.

9. The Rapides Parish Police Jury will be responsible for the operation and maintenance of the structural works of improvement

by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.

10. The costs shown in this agreement represent preliminary estimates. In finally determining the costs to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.

11. This agreement does not constitute a financial document to serve as a basis for the obligation of Federal funds, and financial and other assistance to be furnished by the Service in carrying out the watershed work plan is contingent on the appropriation of funds for this purpose.

    Where there is a Federal contribution to the construction cost of works of improvement, a separate agreement in connection with each construction contract will be entered into between the Service and the Sponsoring Local Organizations prior to the issuance of the invitation to bid. Such agreement will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

12. The watershed work plan may be amended or revised, and this agreement may be modified or terminated, only by mutual agreement of the parties hereto.

13. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

14. The program conducted will be in compliance with all requirements respecting nondiscrimination as contained in the Civil Rights Act of 1964 and the regulations of the Secretary of Agriculture (7 C.F.R. Sec. 15.1-15.13), which provide that no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any activity receiving Federal financial assistance.

RAPIDES PARISH POLICE JURY
Local Organization

By Brian Duke
(Brian Duke)

Title President

Date May 21, 1965

The signing of this agreement was authorized by a resolution of the governing body of the Rapides Parish Police Jury adopted at a meeting
Local Organization
held on May 21, 1965.

C. L. Bushnell
Secretary, Rapides Parish Police Jury

Date May 21, 1965

LOWER WEST RED RIVER SOIL AND WATER CONSERVATION DISTRICT
Local Organization

By J. A. DeKeyzer
(J.A. DeKeyzer)

Title Chairman

Date May 21, 1965

The signing of this agreement was authorized by a resolution of the governing body of the Lower West Red River Soil and Water Conservation District
Local Organization
adopted at a meeting held on May 21, 1965

Secretary, Lower West Red River Soil and Water Conservation District

Date May 21, 1965

Soil Conservation Service
United States Department of Agriculture

By _____

Date _____

WORK PLAN

FOR

WATERSHED PROTECTION,

AGRICULTURAL WATER MANAGEMENT,

AND RECREATION

BAYOU BOEUF WATERSHED
Rapides Parish, Louisiana

Prepared Under the Authority of the Watershed Protection and Flood Prevention Act, (Public Law 566, 83rd Congress, 68 Stat. 666), as amended

Prepared By:

Lower West Red River Soil and Water Conservation District
(Sponsor)

Rapides Parish Police Jury
(Sponsor)

With Assistance By:

United States Department of Agriculture
Soil Conservation Service
Forest Service
and the
Louisiana Department of Public Works

April 1965

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WATERSHED WORK PLAN

Bayou Boeuf Watershed
Rapides Parish, Louisiana
April 1965

SUMMARY OF PLAN

Description of Watershed

This work plan for watershed protection, agricultural water management, and recreation for the Bayou Boeuf Watershed was prepared by the Rapides Parish Police Jury and the Lower West Red River Soil and Water Conservation District as the sponsoring organizations. Technical assistance was furnished by the Soil Conservation Service and Forest Service of the United States Department of Agriculture and the Louisiana Department of Public Works. The work plan proposes improvements to be installed during a 10-year period, at a total estimated installation cost of $7,930,216.

The watershed covers an area of 187,974 acres in the central and southeastern portion of Rapides Parish, of which 83,000 acres is hill land and 104,974 acres is bottomland. Present land uses in the watershed are cropland, 29,213 acres; grassland, 22,253 acres; woodland, 133,339 acres; and miscellaneous, 3,169 acres.

The United States Forest Service administers 56,000 acres of federal land in the Kisatchie National Forest, the Louisiana Forestry Commission administers 8,750 acres of state land in the Alexander State Forest, and the Louisiana Wild Life and Fisheries Commission administers 250 acres of state land within the watershed.

Watershed Problems

There are approximately 5,000 residents in the watershed, of which 2,200 are rural, and the remaining 2,800 live in the towns of Woodworth, Lecompte, and Cheneyville. There are about 250 farms in the watershed, with 120 of these wholly or partially in the area benefited by the works of improvement.

The economy of the watershed is based primarily upon the production and processing of agricultural commodities. With the reduction of numbers of farms and acres in cultivation, the number of agricultural-based employees has been decreasing. The impact on the economy of the watershed is shown by the total out-migration of more than 2,000 people during the last 20 years.

Although the watershed is not classified under the Area Redevelopment Act as an area of chronic unemployment, the local sponsors have realized that the economy of the watershed is suffering due to the decreasing production of agricultural commodities. The processing of agricultural commodities now employs 98 percent of all industrial-based employees.

Agricultural water management in the form of supplying water for supplemental irrigation will tend to stabilize agricultural production, reduce the risks in producing these commodities, and strengthen the economy of the watershed by stabilizing industrial and service employment.

At present there is no adequate recreational area within the watershed for boating, skiing, camping, or picnicking. The facilities provided for these activities in the surrounding area are critically overcrowded.

Works of Improvement

Some land treatment measures within the watershed have been applied by landowners and operators; however, additional technical assistance will be required to assist in the application of needed land treatment measures during the installation period. This acceleration is important if this watershed is to achieve planned project benefits. Installation cost of these land treatment measures is estimated to be $2,313,758, of which Public Law 566 will bear $82,285, or 4 percent, and other funds will bear $2,231,473, or 96 percent.

Structural measures which will be installed during the first 4 years of the installation period are 2 multiple-purpose reservoirs for irrigation and recreation, 10.6 miles of irrigation canals, 4 water control structures, 15 miles of clearing and snagging, and minimum basic recreational facilities. These measures are estimated to cost $5,616,458. Local funds will bear $2,463,416, or 44 percent of this cost, and Public Law 566 will bear $3,153,042, or 56 percent.

Benefits

Average annual benefits accruing to project installation are $220,382 to crop and pasture intensification, $92,250 to recreation, and $105,061 as secondary, for a total of $417,693.

The ratio of average annual benefits accruing to project installation to the average annual cost of structural measures ($207,319) is 2.0 to 1.

Financing Project Installation

The people of Rapides Parish have taxed themselves to provide the local share of the installation cost of structural measures. These funds will be supplemented by a grant from the Louisiana Legislature. The Rapides Parish Police Jury has the power of eminent domain and will furnish all land, easements, and rights-of-way necessary for the construction of the project.

Operation and Maintenance

The land treatment measures will be maintained by the landowners and operators of the farms on which the measures are installed, under agreements with the Lower West Red River Soil and Water Conservation District. Land treatment measures on national forest lands are the responsibility of the United States Forest Service.

Operation and maintenance of all structural measures will be the responsibility of the Rapides Parish Police Jury and will be financed through the same tax that will finance the local share of the installation cost of structural measures.

DESCRIPTION OF WATERSHED

Physical Data

Bayou Boeuf Watershed, comprising 187,974 acres (approximately 293.7 square miles), is located in the south central portion of Rapides Parish and lies about 4 miles southwest of Alexandria, Louisiana.

Bayou Boeuf heads in the vicinity of McNutt and meanders southeasterly about 60 miles through the watershed. It continues below the lower limits of the watershed for an additional 36 miles to its confluence with Bayou Courtableau. The major tributaries within the watershed are Valentine Creek, Lamotte Creek, Castor Creek, Bayou Clear, and Indian Creek.

The topography of the watershed is from level in the southeastern part to hilly in the northern and western portions. The elevations range from a low of 50 feet to a high of 245 feet above mean sea level.

The Forested Coastal Plain Land Resource Area makes up the upland areas of the watershed. The soils in this area are predominantly the medium textured, Ruston and Bowie soils with lesser amounts of the sandy Gustis soils. The original cover of the upland area was forest and remains relatively so today.

The remaining area of the watershed is in the Red River Bottom. The soils range from the medium textured Yahola and very fine sandy loam Norwood to the fine textured Miller clay. Approximately half of this land is in woodland and half is in cropland and pasture.

All soil materials are of the Quaternary Age with the upland portions being represented by Montgomery and Bentley Terrace deposits from the Pleistocene Age. The lowland or bottoms are recent deposits and consist chiefly of sands, silts, clays, and gravel.

Important mineral resources in the watershed are oil, natural gas, and gravel.

Two-thirds of the watershed is in woods. Only 4 percent of this is in good hydrologic condition, 19 percent is fair, 19 percent is poor, and

58 percent is very poor. Most of the upland, forest land is grazed; but very little grazing is controlled. This is detrimental to good forestry practices.

Eighty-six percent of the private woodland has some concentration of cattle, but serious overgrazing occurs on only 9 percent. The present woodland grazing management program needs strengthening. The reduction of grazing to carrying capacity will permit the improvement of forest soils to better retard runoff and reduce sedimentation.

The average annual rainfall of 57 inches is usually well distributed throughout the year. Short drouth periods often occur, however, even when the annual rainfall is normal. The ranges above and below normal are extreme. The maximum recorded rainfall is 88 inches. The minimum is 39.6 inches.

Mean temperatures range from 83 degrees Fahrenheit in July to 50 degrees in January. The extreme recorded temperatures are 3 degrees and 109 degrees above zero. The average frost-free period of 254 days extends from March 8 to November 17.

Water for livestock use is supplied primarily from wells. Some livestock water is obtained from the bayous.

A few farmers in the watershed have attempted to irrigate from Bayou Boeuf and Bayou Robert, but this water source is neither dependable nor adequate. More and more farmers are attempting to use this limited supply.

The major portions of the cultivatable lands are intensively cultivated.

The existing fish and wildlife resources in the watershed range from poor in the open cultivated areas and pastureland to good in the vicinity of the Alexander State Forest. The state forest is managed as a wildlife refuge and has a good concentration of white tail deer, squirrel, and rabbits. A few turkey and bobwhite quail are known to inhabit this area. Lesser amounts of these game species are found throughout the watershed. Fishing is of low intensity, being limited to game fishing in Valentine and Indian Creeks and some fishing for rough fish in Bayou Boeuf. Since these creeks are small and Bayou Boeuf ceases to flow at fairly regular intervals, this sport is of limited value under present conditions.

Economic Data

The economy of the watershed is based on agricultural production and the processing of these products. Approximately 98 percent of all persons in industrial employment in the watershed are engaged in the processing of agricultural products. Agriculture is the only source of employment, except for employment in service occupations incidental to agricultural production.

The incorporated communities located within the watershed are small. Woodworth has a population of 320 and is located near the center of the watershed. Lecompte, population 1,485, and Cheneyville, population 1,037, are in the southern part. These towns serve as primary service centers for the watershed. Alexandria is located immediately to the east of the area and supplies a large part of the trade.

The history of the watershed indicates that Bayou Boeuf was used for transportation in the early days of settlement. For this reason nearly all of the land was settled in such manner that each farm had a "front" on Bayou Boeuf. This ownership pattern has been perpetuated by the construction of roads on the highest land which is near the bayou.

About 56 percent of the watershed (104,974 acres) is bottomland, which includes nearly all of the cultivated and pasture lands. The Norwood and Yahola soils are highly productive and intensively cultivated. The major crops are cotton, seed corn, improved pasture, and sugar cane. Other crops grown are soybeans, supplemental dairy pasture, and rice.

The remaining 44 percent (83,000 acres) is upland. These areas are predominantly in cutover forest land. Re-establishment of cover has been good through natural reproduction and reforestation.

The present land use of the watershed is as follows:

Land Use	Acres	Percent
Cropland	29,213	15
Pasture	22,253	12
Woodland	133,339	71
Miscellaneous 1/	3,169	2
Total	187,974	100

1/ Includes roads, streams, farmsteads, built-up and urban areas, etc.

Most of the land in the watershed is privately owned. There are 64,950 acres owned by state and federal agencies, of which the United States Forest Service administers 56,000 acres; the Louisiana Forestry Commission, 8,750 acres; and the Louisiana Wild Life and Fisheries Commission, 250 acres.

The Census of Agriculture shows the following information for Rapides Parish:

Item (Average Per Farm)	1954	1959
Size (acres)	77	112
Value of sales of farm products	2,712	4,278
Value of land, buildings, and improvements (per acre)	155	214
Average investment	11,935	23,968
Average return (per dollar invested)	0.23	0.18

The majority of the farms in the watershed are owner operated and are much larger than the parish average. The per-acre value, however, is very nearly true. There are approximately 250 farms in the watershed with an average size of 460 acres. The trend is toward large farms

and stable ownership.

The farms are highly commercialized. Approximately 12,000 acres of cotton and 3,000 acres of seed corn are presently being produced. The trend has been to reduce these crops as acreage allotments and the number of farms decrease. Hay plantings have increased as these two crops were reduced. The 1959 Agricultural Census shows that both cotton and corn acreages in Rapides Parish have decreased by more than 30 percent from 1949 to 1959, while hayland has increased by 65 percent.

There are 7 industrial developments in the watershed. Six of these are for the processing of agricultural products and employ 98 percent of the total industrial workers employed in the watershed.

The area is served by 150 miles of serviceable roads, of which 70 miles are paved. This road system is adequate for the needs of the area. Three railroads also serve the watershed. Facilities for car loading and carload shipments are available at Lecompte, Cheneyville, and Woodworth. Distribution of less than carload lots is made at Alexandria, which is located immediately adjacent to the central part of the area.

The population of the watershed is about 5,000 people. This is a total decrease in population of more than 2,000 persons in the last 20 years. As farms increase in size and mechanization, the farm population decreases. This trend would continue without a watershed project.

With the decreasing cotton and corn acreage in the watershed and the dependence of the economy primarily on agricultural production and processing, this project is basic to the stabilization of the declining population and to the economy of the watershed.

Recreation in this area is limited. The installation of the project will serve the farming enterprise, yet enhance the economic stability of the area by offering opportunities to the local people for additional income from activities related to recreation. The proximity of tourist accommodations, major highways, and the rolling pine hills provide a setting for ideal recreational development.

Land Treatment Data

The watershed is served by the Soil Conservation Service Work Unit at Alexandria, assisting the Lower West Red River Soil and Water Conservation District. The district has entered into a cooperative agreement with the owners of 175 farms in the watershed, with a total of 50,769 acres, or about 44 percent of the land in farms. Basic farm plans have been developed on 139 of the 175 farms under district agreement.

During the last ten years farmers have applied sound soil and water conservation practices costing $1,133,635 (table 1A). Sound conservation practices have been followed by some farmers for more than 10 years, and the rate of establishment of these measures has been considerably increased in the last decade.

WATERSHED PROBLEMS

Storm runoff from the hill land floods areas immediately adjacent to these hills for several days following heavy rainfall; but these flooded areas are low and swampy, and floodwater damages are insignificant. The original cover was hardwood timber and it has been cut over, leaving only low-value trees and underbrush.

Of the 83,000 acres of upland in the watershed, 78,700 acres is in woodland. Most of this is under management, and the erosion and sediment damages are low. Some localized areas have been classified as critical areas of erosion and sediment source areas, but these areas are minor from a watershed standpoint. Land treatment measures to correct these conditions are included in the plan.

On-farm drainage in the watershed is being done by the local landowners on an individual farm basis. There is a need for group drainage facilities.

Problems Relating to Water Management

Irrigation Problems

The average annual rainfall is about 57 inches. The annual and monthly variation is extreme. The maximum recorded annual rainfall is 88 inches and the minimum is 39.6 inches. The maximum known monthly rainfall is 36.91 inches, which occurred in June 1886 and of which over 21 inches fell in one 24-hour period. June, July, and August are the months of greatest irrigation demand. The average rainfall for these months is about 4.0, 5.2, and 4.0 inches, respectively. The minimum recorded rainfall for these three months, however, is 0.51, 1.44, and 0.1 inches. When drouth periods occur, they affect the economy of the area and the efficiency of farm operation.

The greatest need of the watershed is a dependable supply of good quality irrigation water to supplement rainfall on farmland lying along and adjacent to Bayou Boeuf and Bayou Robert. A total of 26 farmers have purchased irrigation equipment, prepared approximately 3,000 acres for irrigation, and attempted supplemental irrigation. Due to the lack of a dependable supply of water, only 5 farmers, with a total of 500 acres, have been able to obtain adequate water for successful supplemental irrigation. Of the 97 farmers contacted who could profitably use irrigation water, 80 expressed a desire to use the water if it could be made available.

The small amount of water which can be stored in the existing channel is adequate to irrigate only about 5 percent of the land and crops for which a dependable supply is needed. These bayous flow only after a rain which produces runoff. The Norwood and Yahola soils, which are the predominant soils cultivated in the bottomland, are suitable for irrigation. Cotton, pasture, corn, and truck crops produced on this soil are highly adapted to irrigation.

Recreation Problems

Water-based recreational facilities are inadequate to meet the needs of the area. There is presently only one lake within 50 miles of the heavily populated Alexandria-Pineville area where water skiing and boating can be enjoyed. This lake is small and seriously overcrowded most of the time. One additional lake is presently under construction within this use-area. This lake will have approximately 500 acres of open water, and minimum basic facilities will be provided for enjoyment of water-based recreational activities. Even after this lake is constructed, the facilities for water-based recreation will remain seriously overcrowded. Swimming and picnicking areas are inadequate, the main ones available being in city parks. Fishermen must drive 35 to 70 miles to enjoy this sport.

The 1960 population of the area within a radius of 50 miles of the watershed is about 340,000. It is anticipated that this will increase to over 400,000 by 1985. Census data shows there was a 91 percent increase in aggregate family income in this area in 1960 over that of 1950. This is an annual increase of 9.1 percent, which may be expected to continue. Data in the "Historical Census of the United States" shows that as family income increases the portion spent for recreation also increases. It is, therefore, expected that this already acute shortage of water facilities for recreation will become progressively more severe unless additional recreational areas are provided.

The residents of Rapides Parish have voted to tax themselves to provide sufficient funds for developing recreational facilities in this watershed.

Projects of Other Agencies

An inter-agency comprehensive study of the soil and water resources of the Red River Basin is presently being made. The Bayou Boeuf Watershed is within the area covered by the study. The primary agency responsibilities rest with the Corps of Engineers and the Department of Agriculture. Assistance is being provided by the Department of Interior; the Department of Health, Education and Welfare; the Federal Power Commission; and the states involved. This study is scheduled to be completed in fiscal year 1968. This work plan will not conflict with the comprehensive plan for the Red River Basin.

The Bayou Cocodrie and Tributaries feature of the Flood Control, Mississippi River and Tributaries project, a U. S. Army Corps of Engineers project, was authorized by the Flood Control Act of August 18, 1941. This feature provides for the Bayous Rapides-Boeuf-Cocodrie Diversion Channel extending from Bayou Rapides just west of Alexandria via a land cut to Bayou Boeuf, Bayou Boeuf, a land cut to Bayou Cocodrie, Bayou Cocodrie to its junction with Bayou Boeuf at Washington, and a land cut to Bayou Courtableau at the west Atchafalaya Basin protection levee; gated control structures at the head of the diversion channel and in Bayou Lamourie; an overflow weir at the head of the Bayou Boeuf-Bayou Cocodrie section of the diversion channel; enlargement of about 14 miles of Bayou Boeuf from vicinity of Kincaid to the diversion channel; clearing and snagging of about 10 miles of Bayou Cocodrie upstream of the diversion channel; the construction of a 3- by 15- by 10-foot barrel drainage structure through the levee at Bayou Courtableau in addition to the existing 5-barrel structure. Construction of the

diversion channel, including the control structures therein, and the Bayou Lamourie Control Structure has been completed. The project will be about 60 percent complete as of June 30, 1965. This improvement provides for a diversion of a part of the floodflows of Bayou Rapides and Bayou Boeuf in Rapides Parish into Bayou Cocodrie and thence into Bayou Courtableau and the Atchafalaya Basin Floodway. It provides flood protection for the England Air Force Base and a part of the city of Alexandria as well as serving as the outlet channel for the surrounding area.

The diversion channel and the old channel of Bayou Boeuf will furnish an adequate system for the distribution of irrigation water to farmland in the benefit area.

BASIS FOR PROJECT FORMULATION

The local sponsors have asked that a project be formulated to provide supplemental irrigation water for the entire bottomland area in the watershed presently in production which can be economically irrigated. The local sponsors, realizing that land treatment measures are the basis for a sound agricultural water management program and that a recreation facility within the watershed would stimulate economic activity, have also asked that the project include these measures.

Municipal and industrial water supplies were considered adequate. Watershed protection, agricultural water management, and recreation needs were reviewed with local sponsors and other interested groups, including representatives of parish, state, and federal agencies. Determination was made, first, of the land treatment measures which contribute directly to watershed protection and agricultural water management and those measures which remain to be done in the watershed, based on land capability classes determined from soil surveys.

A study of supplemental irrigation water needs indicated that the most economical plan would be to provide adequate water for crops 9 years out of 10.

Under this plan, a water shortage may develop late in the irrigation season 1 year out of 10.

Determination was made that facilities for water-based recreation were very limited in the Lecompte area and that a critical need exists for additional facilities for picnicking, swimming, fishing, water skiing, and boating.

It was agreed by the sponsors and the Service to plan a project that would:

1. Include land treatment measures, based on current needs, which can be applied during the project installation period and which contribute directly to watershed protection and agricultural water management.

2. Provide sufficient water for irrigation of the 20,467 acres of land on which it may be applied economically for a period of 9 years out of 10.

3. Provide water-based recreation for the watershed.

A system of storage reservoirs, weirs, and stream channel improvement will allow the landowners to efficiently produce the crops now in production at a sustained yield and reduce the acreage of cotton.

All of the silt loam, very fine sandy loam, and silty clay loam types of Gallion, Norwood, Yahola, and Miller soils to be irrigated will respond to irrigation readily. All of the crops to be irrigated, such as cotton, corn, and forage crops, will respond readily to irrigation.

WORKS OF IMPROVEMENT TO BE INSTALLED

Land Treatment Measures

The soil and water conservation district has been assisting landowners in the application of basic conservation programs on the farms of the watershed for several years. This program, based on the use of each acre of agricultural land within its capabilities and its treatment in accordance with its needs for present and future production, is essential in a sound and continuing agricultural water management program for the watershed.

Basic to the attainment of this objective is the establishment of all applicable soil and water conservation and plant management practices. The extent of needed land treatment measures which have been applied to date within the watershed represents an expenditure of approximately $1,133,635 by landowners and operators within the last 10 years. Table 1A shows the measures which have been installed.

The accelerated application and continued maintenance of land treatment measures is particularly important for protection of the 37,370 acres of land which comprise drainage areas above planned multiple-purpose structures. These measures consist mostly of tree planting, modification of tree harvesting methods, releasing preferred species, roadbank stabilization, gully check dams, and strengthening woodland grazing management programs. Timber stands in certain areas consist primarily of growth with low value for improving the hydrologic condition of the watershed area. Releasing preferred soil building species will improve the hydrologic condition. These measures will reduce sediment accumulation behind the proposed structures. The measures will reduce the capacity which must be provided for sediment accumulation.

Table 1 includes estimates of the acreage in each major land use which will receive accelerated land treatment during the 10-year project

installation period. These measures will be established and maintained by the landowners and operators in cooperation with present soil and water conservation district programs. In addition to the presently available technical assistance, $82,285 will be made available from Public Law 566 funds to accelerate the establishment of these practices and measures. Included in these funds is $35,523 to complete essential soil surveys at an early date.

In this watershed most of the hill lands have been retired from cultivation and planted to grasses or trees. About 5 percent of the private woodland needs restocking by planting. Proper grazing will be installed on about 600 acres of private land. The farms in the hill areas are small. Open areas range in size from 5 to 20 acres and are interspersed throughout the hill area of the watershed. About 3,000 acres of this open land is now in pasture and is properly grazed.

In the bottomland area, proper use will be practiced on approximately 21,500 acres of improved pasture, and 17,000 acres of this will be renovated by seeding and fertilizing. The remaining area will be maintained through cultural practices to assure a good grass cover. Wildlife plantings such as field borders and special treatment areas to provide food and cover for wildlife will be encouraged. Conservation cropping systems and crop residue use will be practiced on approximately 20,000 acres. An additional 2,000 acres will have grasses and legumes in rotation. This area will have 35 irrigation systems installed on approximately 15,000 acres. Land grading, land leveling, or land smoothing will be established on 11,500 acres where irrigation is to be done. Necessary water management systems for disposal of surplus water will be installed.

The installation of the agronomic land treatment measures will reduce sheet erosion and increase infiltration by the improvement of cover conditions. Permanent type land treatment measures will increase the efficiency of the water delivery and disposal system and assure landowners of sustained productivity.

Structural Measures for Agricultural Water Management and Recreation

Two multiple-purpose storage reservoirs will be constructed for the storage of water for supplemental irrigation of cropland and recreation. Water stored in each reservoir is allocated to irrigation, recreation, and sediment reserve. Water will not be withdrawn from either reservoir for irrigation purposes when the water surface is at or below the elevation of the permanent pool. The permanent pool elevation is determined by the volume allocated to submerged sediment and recreation (table 1).

Reservoir No. 1 will store 25,000 acre-feet, of which 19,810 will be allocated to irrigation, 4,310 to recreation, and 880 to sediment. A concrete spillway will be utilized for disposal of storm runoff. A vegetated spillway will also be used to discharge a portion of extremely high discharges and to minimize cost of the concrete spillway. The vegetated spillway will function when the depth of flow in the concrete

spillway exceeds 4.9 feet. The embankment will be compacted earth fill. The total available storage represents about 10.7 inches of runoff from the 34.86 square mile drainage area.

Approximately 900 acres will be cleared upstream from the dam in Reservoir No. 1. In addition to this clearing, boat lanes will be provided in the uncleared portion to provide boat access to the portion of the reservoir not cleared. It is estimated that about 30 acres of clearing will be necessary in the boat lanes. The area of the reservoir that is to be cleared will include approximately 260 acres of national forest lands adjacent to probable recreational areas to be provided by the U. S. Forest Service. The clearing of this land is included in the reservoir construction cost and will be shared in accordance with the provisions of the work plan agreement. Reservoir No. 2 will store 25,000 acre-feet, which represents approximately 14.3 inches of runoff from the 23.53 square mile drainage area. Of the total available storage, 17,880 acre-feet will be allocated to irrigation, 6,550 to recreation, and 570 to sediment. A single concrete spillway will dispose of storm runoff. The embankment will be compacted earth fill.

Approximately 1,000 acres will be cleared upstream from the dam in Reservoir No. 2 including about 50 acres of boat lanes to make accessible uncleared areas.

The average annual runoff, or dependable water yield, from each of these areas is about 19 inches. This is adequate to replenish water used for irrigation each year. The outlet works of the reservoirs will be designed to be manually operated so that either structure can furnish maximum irrigation water needs.

These reservoirs will be designed in such manner that a combined minimum release of 25 cubic feet per second will automatically be allowed to flow from the reservoirs. Reservoir No. 1 will release 15 cubic feet per second and Reservoir No. 2 will release 10 cubic feet per second. Base flow in excess of this amount will be released over the concrete spillways when the reservoirs are full. This will tend to stabilize the flow in Bayou Boeuf.

The estimated total installation cost of these 2 reservoirs is $4,548,952.

Bayou Boeuf is a high bank stream. The natural slope is gentle, and away from the bayou. Nearly all of the farms have a front on the bayou. Irrigation water can be made available to these farms by releasing stored water from the 2 reservoirs through gated conduits directly into Bayou Boeuf. The individual landowners or operators can obtain the water by pumping from the bayou.

Three water control structures (low-level weirs) will be constructed in Bayou Boeuf between Lecompte and the lower end of the watershed. These will cause water to be stored in the present channel to an average depth of about 3 feet. This small storage will be used as a sump from which individual farmers can pump irrigation water. Floodwater, and all water released from the reservoirs in excess of the irrigation requirements, will pass over the weirs and continue the natural flow along Bayou Boeuf.

Flood flows will pass over the weirs without causing a detrimental increase in the water surface elevation in Bayou Boeuf or the Bayou Boeuf-Cocodrie Diversion Canal.

These low-level weirs will serve agricultural water management and will cost an estimated $221,190.

Bayou Robert, which presently drains into Bayou Boeuf, will serve as an irrigation distribution canal to reach about 3,000 acres which do not front on Bayou Boeuf. In order to furnish water to these landowners, it will be necessary to construct a compacted earth fill dam across Bayou Robert near its confluence with Bayou Boeuf to hold irrigation water in Bayou Robert. The normal water level in Bayou Robert will be about 6 feet higher than in Bayou Boeuf when farmers are withdrawing water from both streams for irrigation. Water will have to be lifted from Bayou Boeuf into Bayou Robert by pump.

This dam will be constructed with an emergency spillway and gated drainage structure so that Bayou Robert may continue to function as a drainage way during periods of storm runoff. The dam, drainage structure, pump, and associated appurtenances will serve agricultural water management and are considered a water control structure. The estimated cost is $84,360.

Approximately 10.6 miles of Bayou Robert will be deepened and improved to deliver irrigation water more effectively to the farmers. In order to adequately deliver this water to the users, the replacement of 5 wooden bridges, 1 railroad bridge, and 2 road culverts will be necessary. This canal will serve agricultural water management. The estimated cost is $247,740.

Approximately 15 miles of Bayou Boeuf will need to be cleared of trees and underbrush in order to deliver irrigation water more efficiently to landowners. This clearing and snagging is estimated to cost approximately $97,920. This work is for agricultural water management.

The location of the planned structural measures is shown on the project map. The details of the quantities, costs, and design features of all measures are shown in tables 1, 2, 3, 3A, and 3B.

The surface area of Reservoir No. 2 at the elevation of the irrigation pool is 2,250 acres, and the average depth is about 11 feet. The surface area of Reservoir No. 1 at the elevation of the irrigation pool is 1,920 acres, and the average depth is about 13 feet.

A recreational area will be developed adjacent to Reservoir No. 2, and minimum basic facilities will be installed for public use. Sufficient facilities will be provided to take care of the basic needs of approximately 1,275 visitors during the peak use season. Health and sanitation facilities will be provided for the protection and use of the visitors. A public supply of drinking water, electricity, bath and comfort stations, swimming areas, shelters from sudden thunder showers, boat launching ramps, wharves for loading and unloading boat passengers, parking areas,

picnic tables, fireplaces, garbage disposal units, camping sites, and access roads will be provided. Approximately 60 acres of land will be needed to install these facilities. The estimated cost of developing the recreational area, including the value of the land, is $416,296. Table B shows amount and kind of facilities to be provided, cost, etc. Figure 1 shows the location of the facilities.

EXPLANATION OF INSTALLATION COSTS

Land Treatment Measures

The cost of land treatment measures for watershed protection and agricultural water management, totaling $2,313,758, is shown in table 1. About 96 percent of the cost of land treatment will be borne by other than Public Law 566 funds. This includes service and labor by landowners and operators, cost sharing by the Agricultural Conservation Program, and help from other programs. This amounts to $2,231,473 of the total cost.

It is expected that federal and state agencies will provide technical assistance to the going soil and water conservation district program valued at $78,267 during the 10-year installation period. This is insufficient to accomplish the needed job. Public Law 566 will provide $82,285, of which $35,523 is for completion of standard soil surveys and the remainder is for the acceleration of technical assistance in order that the needed land treatment may be applied during the installation period.

No Public Law 566 funds will be provided for the application of land treatment measures on federal lands.

Structural Measures

The 2 reservoirs serve both agricultural water management and recreation. The cost of those features that are used jointly by both purposes, including sediment storage, is allocated on the basis of the proportion of reservoir capacity dedicated to each purpose. The recreation development is allocated entirely to recreation and the remaining structures are single-purpose agricultural water management facilities.

Reservoir No. 1

The estimated construction cost is $1,892,000, which includes a 10 percent allowance for contingencies. Public Law 566 will bear 50 percent ($946,000) of the total construction cost and the remaining 50 percent ($946,000) will be borne by local funds. Water will be allocated to recreation in this reservoir. No minimum basic facilites will be planned as part of this work plan; however, the U. S. Forest Service will provide recreational areas and facilities, as funds permit, adjacent to this lake through its continuing program of providing public use areas for recreation on all national forest land.

The total cost of installation services for this structure is $619,006 and will be borne entirely by Public Law 566 funds.

The cost for land, easements, and rights-of-way is valued at $114,893 and includes value of land, $50,400; legal fees (including surveys and appraisals), $31,100; and relocation, removal, or modification of existing facilities, $33,393. Local funds will pay all of these costs.

The estimated cost of contract administration and project promotion is $22,000 and will be paid entirely from local funds.

Of the total cost ($2,647,899), Public Law 566 will pay 59 percent ($1,565,006) and other funds will bear 41 percent ($1,082,893). Costs were allocated 82 percent ($2,171,277) to agricultural water management and 18 percent ($476,622) to recreation.

Reservoir No. 2

The Soil Conservation Service estimated construction cost is $1,246,300, which includes a 10 percent allowance for contingencies. Public Law 566 will bear 50 percent ($623,150) of the total construction cost, and the remaining 50 percent ($623,150) will be borne by local funds.

The total cost of installation services for this structure is $407,753, and the entire amount will be borne by Public Law 566.

The cost for land, easements, and rights-of-way, which is to be paid entirely by local funds, amounts to $225,000 and includes value of land, $185,000, legal fees (including surveys and appraisals), $15,000, and modification of Beechwood Fish Hatchery, $25,000.

The estimated cost of contract administration and project promotion is $22,000 and will be paid entirely from local funds.

Of the total cost ($1,901,053), Public Law 566 will pay 54 percent ($1,030,903) and other funds will bear 46 percent ($870,150). Costs were allocated 73 percent ($1,387,770) to agricultural water management and 27 percent ($513,283) to recreation.

Minimum Basic Facilities for Recreation

Minimum basic facilities for recreation will be provided adjacent to Reservoir No. 2. Construction cost of these facilities is estimated to be $290,690, which includes a 20 percent allowance for contingencies. Public Law 566 will bear 50 percent of these construction costs ($145,345) and the local sponsors will provide 50 percent ($145,345).

Installation services required for these measures is estimated to be $95,106, of which Public Law 566 will bear 50 percent ($47,553) and 50 percent ($47,553) will be borne by other than Public Law 566 funds.

Land, easements, and rights-of-way cost is estimated to be $19,500, of which $16,500 is the value of the land. Legal fees, including surveys and appraisals, are estimated to be $3,000. These will be paid entirely by local interests.

Contract administration and project promotion is estimated to cost $11,000 and will be paid entirely by local funds.

Of the total cost ($416,296), Public Law 566 will pay 46 percent ($192,898), and other funds will pay 54 percent ($223,398). All costs are allocated to recreation.

Water Control Structures 1, 2, and 3

Structures 1, 2, and 3 are low-level weirs in Bayou Boeuf. The estimated construction cost of these weirs is $166,060, which includes a 10 percent allowance for contingencies. Public Law 566 will bear 50 percent ($83,030) of the construction cost, and 50 percent ($83,030) will be borne by local funds.

The cost of installation services is estimated to be $54,330 and will be paid entirely from Public Law 566 funds.

Land, easements, and rights-of-way cost is valued at $300 and is to be paid entirely by local funds.

The cost of contract administration is estimated to be $500 and is to be paid entirely by local funds.

These structures serve agricultural water management, and the entire cost ($221,190) is allocated to this purpose. Public Law 566 will bear 62 percent ($137,360) of the total cost, and local funds will bear 38 percent ($83,830).

Clearing and Snagging Bayou Boeuf

Bayou Boeuf will be cleared and snagged for a distance of about 15 miles downstream from Lecompte.

The estimated construction cost of this work is $62,040, which includes a 10 percent allowance for contingencies. Public Law 566 will bear 50 percent ($31,020) of the construction cost, and 50 percent ($31,020) will be borne by local funds.

The cost of installation services is estimated to be $20,300 and will be paid entirely from Public Law 566 funds.

Land, easements, and rights-of-way cost is valued at $14,580, which includes value of land ($13,250) and legal fees ($1,330). This cost will be paid entirely from local funds.

The cost of contract administration is estimated to be $1,000 and is to be paid entirely from local funds.

This work is for agricultural water management, and the entire cost ($97,920) is allocated to that purpose. Public Law 566 will pay 52 percent ($51,320) of the total cost, and local funds will pay 48 percent ($46,600).

Water Control Structure No. 4

This structure is to be constructed on Bayou Robert at the confluence of Bayou Boeuf. The estimated construction cost is $63,030, which includes a 10 percent allowance for contingencies. Public Law 566 will bear 50 percent ($31,515) of this cost, and 50 percent ($31,515) will be borne by local funds.

The cost of installation services is estimated to be $20,630 and will be paid entirely from Public Law 566 funds.

Land, easements, and rights-of-way cost is valued at $200 and will be paid from local funds.

The cost of contract administration is estimated to be $500 and will be paid from local funds.

Of the total cost ($84,360), Public Law 566 will pay 62 percent ($52,145) and local funds will pay 38 percent ($32,215). The entire cost is allocated to agricultural water management.

Irrigation Canal

Bayou Robert will be improved and deepened for about 10.6 miles above its confluence with Bayou Boeuf.

The estimated construction cost is $149,200, which includes a 10 percent allowance for contingencies. Public Law 566 will bear 50 percent ($74,600) of this cost, and 50 percent ($74,600) will be borne by local funds.

The cost of installation services is estimated to be $48,810 and will be paid entirely from Public Law 566 funds.

Land, easements, and rights-of-way cost is valued at $42,730, which includes value of land ($4,550), legal fees ($500), and replacement of existing facilities ($37,680). This cost will be paid entirely from local funds.

The cost of contract administration and project promotion is estimated to be $7,000 and is to be paid entirely from local funds.

Of the total cost ($247,740), Public Law 566 will pay 50 percent ($123,410) and local funds will pay 50 percent ($124,330).

The total estimated construction cost of structural measures is $3,869,320, including allowances for contingencies. Of this total, Public Law 566 will bear $1,934,660, or 50 percent, and local funds will bear $1,934,660, or 50 percent.

Total estimated cost of installation services is $1,265,935, of which Public Law 566 will bear $1,218,382, or 96 percent; and local funds will bear $47,553, or 4 percent.

Land, easements, and rights-of-way cost for structural measures is estimated to be $417,203, which will be borne entirely by local funds.

Contract administration of structural measures and project promotion is estimated to be $64,000, which will be paid entirely by local funds.

Of the total estimated cost of structural measures, $5,616,458, Public Law 566 will pay $3,153,042, or 56 percent; and local funds will pay $2,463,416, of 44 percent.

The total estimated cost of project installation is $7,930,216, of which $3,235,327, or 41 percent, will be paid by Public Law 566 funds; and $4,694,889, or 59 percent, will be paid by local funds.

The estimated schedule of obligations for the 10-year installation period covering installation of both land treatment and structural measures is as follows.

Schedule of Obligations

Fiscal Year	Measures	Public Law 566 (dollars)	Other (dollars)	Total (dollars)
1st	Land Treatment	-	72,000	72,000
	Technical Assistance	1,560	7,826	9,386
	Soil Surveys	12,000	-	12,000
	Construction - Reservoir No. 1	946,000	946,000	1,892,000
	Land, Easements, and Rights-of-Way	-	114,893	114,893
	Contract Administration and Project Promotion	-	22,000	22,000
	Installation Services	300,000	-	300,000
2nd	Land Treatment	-	75,000	75,000
	Technical Assistance	1,560	7,826	9,386
	Soil Surveys	10,000	-	10,000
	Construction - Reservoir No. 2	623,150	623,150	1,246,300
	Bayou Boeuf Clearing and Snagging	31,020	31,020	62,040
	Bayou Boeuf Irrigation Structure	83,030	83,030	166,060
	Land, Easements, and Rights-of-Way	-	239,880	239,880

(continued next page)

Schedule of Obligations (continued)

Fiscal Year	Measures	Public Law 566 (dollars)	Other (dollars)	Total (dollars)
	Installation Services	400,000	15,000	415,000
	Contract Administration and Project Promotion	-	21,500	21,500
3rd	Land Treatment	-	80,000	80,000
	Technical Assistance	1,560	7,826	9,386
	Soil Surveys	8,000	-	8,000
	Construction - Recreational Area	145,345	145,345	290,690
	Bayou Robert Irrigation Canal	74,600	74,600	149,200
	Bayou Robert Drainage Structure 1/	31,515	31,515	63,030
	Land,Easements, and Rights-of-Way	-	62,430	62,430
	Contract Administration and Project Promotion	-	15,000	15,000
	Installation Services	350,000	20,000	370,000
4th	Land Treatment	-	200,000	200,000
	Technical Assistance	6,011	7,827	13,838
	Soil Surveys	5,523	-	5,523
	Contract Administration and Project Promotion	-	5,500	5,500
	Installation Services	168,382	12,553	180,935
5th	Land Treatment	-	220,000	220,000
	Technical Assistance	6,011	7,827	13,838
6th	Land Treatment	-	270,000	270,000
	Technical Assistance	6,012	7,827	13,839
7th	Land Treatment	-	300,000	300,000
	Technical Assistance	6,012	7,827	13,839
8th	Land Treatment	-	315,000	315,000
	Technical Assistance	6,012	7,827	13,839
9th	Land Treatment	-	315,000	315,000
	Technical Assistance	6,012	7,827	13,839
10th	Land Treatment	-	306,206	306,206
	Technical Assistance	6,012	7,827	13,839
	Total	3,235,327	4,694,889	7,930,216

1/ Includes Pumping Plant.

This schedule may be adjusted from year to year on the basis of any significant changes in the plan found to be mutually desirable in light of appropriations and accomplishments actually made.

EFFECTS OF WORKS OF IMPROVEMENT

The installation of the structural works of improvement will provide a source of water for supplemental irrigation of the land adjacent to Bayou Boeuf which may be economically irrigated. A maximum of 20,467 acres will be irrigated each year. An additional 3,248 acres will be in the normal crop rotation pattern and will be in non-irrigated crops.

The following table gives the crops to be irrigated, their acreage, and the soil units on which they are grown.

Crop	Soil Unit (Acres) 8	4	3	Total Acres
Cotton	5,143	3,785	-	8,928
Corn and Beans	626	474	-	1,100
Corn (Hybrid Seed)	1,774	1,343	-	3,117
Sugar Cane	3,949	125	-	4,074
Rice	-	72	450	522
Truck Crops	136	-	-	136
Improved Pasture	956	1,634	-	2,590
Total	12,584	7,433	450	20,467

Certain changes are anticipated in the land use in the area adjacent to Bayou Boeuf due to the availability of water for supplemental irrigation. Listed below is a tabulation of future land use both with and without project installation for the area.

Future Land Use in the Area Adjacent to Bayou Boeuf

Land Use	Without Project Acres	Percent	With Project Acres	Percent
Cropland	23,405	33	20,770	30
Pasture	23,617	34	26,252	37
Woodland	18,892	27	18,892	27
Miscellaneous	4,000	6	4,000	6
Total	69,914	100	69,914	100

The land use changes noted in the above table will take place in the area along Bayou Boeuf where water can be made available for supplemental irrigation. The most efficient use of available irrigation water can be made by applying the water on soils in Soil Units 8 and 4. Certain crops which cannot be economically irrigated that are presently being grown on soils in these groups will be replaced by crops which can be irrigated but which are now being grown on soils in Soil Unit 3. This will not represent an increase in the acreage of these crops since a reduction will be made in one area for each corresponding increase in another. Approximately 1,400 acres will be affected in this manner. In addition,

certain reductions in acreages will be effected by the project in order to more efficiently apply the supplemental irrigation water.

About 4,383 acres of woodland will be reclassified as miscellaneous land following project installation due to the construction of the reservoirs.

An adequate supply of water for supplemental irrigation will be available 9 years out of 10. A shortage will occur in the tenth year late in the irrigation season.

Approximately 85 farms will be benefited through increased farm income. The additional income will be reflected throughout the watershed and its immediate vicinity in the form of expenditures for a higher standard of living, additional goods used in agricultural production, and demand for additional services. These local secondary benefits will spread throughout the community, tend to stabilize the economy of the entire watershed, and even offer opportunities for additional services. Secondary benefits were evaluated. Although the parish is not designated under the Area Redevelopment Act as an area of chronic underemployment, unemployment constitutes a serious problem. This problem has been increased through the incorporation of small farms into the larger ones, mechanization of the larger farms, and a downward trend in over-all agricultural production. Installation and the operation and maintenance of the project will provide direct employment for some local labor. The most important effect of the installation of the project will be the opportunity for additional employment offered by the more intensive type of agriculture that will result from operation of the project and the processing of the agricultural commodities produced.

Public recreational benefits will be afforded in both Reservoir No. 2, where minimum basic facilities will be provided, and in Reservoir No. 1, where water for recreational use will be stored. The need for additional water-based recreational facilities is evident in the area. There are approximately 340,000 people living within normal driving distance of these reservoirs. The number of people participating in water sports has increased greatly during the last several years. Primary recreational uses of this stored water will be boating, fishing, swimming, skiing, and picnicking.

When water in Reservoir No. 2 is at spillway crest elevation, a small portion of the state-owned land on which the Beechwood Fish Hatchery is located will be inundated. During passage of the design storm, the effectiveness of certain hatchery ponds will be reduced. Measures are provided to allow this hatchery to continue to function following project installation in accordance with plans furnished to the Louisiana Wild Life and Fisheries Commission by the Louisiana Department of Public Works.

The area where these two reservoirs are to be constructed presently supports deer, squirrel, rabbits, and bobwhite quail. The woodlands are valuable deer and squirrel habitat, and the Indian Creek area is of outstanding quality for this part of the state. Although only a small percentage of the woodland area of the watershed is involved, the loss to the species it now supports will be severe because of the high quality habitat that will be destroyed. The impoundments are expected to be utilized by waterfowl and to provide some waterfowl hunting, but this will be less than the hunting opportunities that could be provided by deer and squirrel populations.

Although some types of hunting opportunities will be curtailed by the construction of the reservoirs, opportunities for total outdoor recreation will be made available to many more people than now use these areas. These recreation opportunities include fishing, swimming, picnicking, boating, and skiing.

An adequate supply of water for recreational purposes is assured. It is anticipated that approximately 44,500 persons will use the recreational facilities provided each year under present conditions. This does not include participation in recreational activities which will be expected at recreational areas that will be constructed by the U. S. Forest Service incidental to their continuing plan of providing public use areas for recreation in all national forest land. The peak recreation season extends from May 1 until September 15 each year. It is anticipated that 90 percent of all persons visiting the facility throughout the year will do so during this four and one-half month period. The estimated present average peak daily use is 1,275 visitors. The recreational facilities will be used in the following manner: swimming 379, skiing 236, boating 165, picnicking 270, and casual visits 225. The facilities planned as part of this work plan will be adequate for the present. Additional facilities are planned by the local sponsors as the demand grows. Approximately 60 acres are to be developed for the recreation area.

The low weirs which will be constructed in Bayou Boeuf will cause the water to be stored to a minimum depth of 2 feet and an approximate maximum depth of 4 feet. This will provide about 35 miles of additional water for public use. The town of Cheneyville is presently landscaping the banks of Bayou Boeuf where it passes through the city limits. They have leveled off rough areas and are flattening out steep slopes to provide a park-like area on each bank of the bayou. A maintenance program is proposed by the city on this area, and it is to be used for recreational purposes. Other areas along these 35 miles of bayou may be likewise improved, thereby enhancing the real estate value as well as the natural beauty of the landscape.

Details of the minimum basic facilities provided, estimated costs, etc., are listed in table 2B.

Other sources of water for municipal and industrial use are considered adequate at this time.

PROJECT BENEFITS

Crop and pasture benefits accruing to the benefit area, amounting to $220,382 annually, are from more intensive land use only. Approximately 2,635 acres presently in cropland will be changed to pasture. Project benefits were derived by discounting net benefits for chance of meeting full requirements and actual participation. These benefits were delayed up to 20 years before reaching full level of benefits. Incidental recreation benefits due to irrigation water were not evaluated.

Recreation benefits were evaluated for both multiple-purpose reservoirs. Visitor-days were estimated from present population and economic standard

of living within a 50-mile radius of the reservoirs. Average annual use by surface acreage of the recreation pool only was developed from 7 similar bodies of water in Louisiana. Visitor-days to Reservoir No. 1 were assigned a value of $.50 per day since no basic facilities were included. Visitor-days to Reservoir No. 2 were assigned a value of $1.50 since minimum basic facilities were provided. Replacement costs for the minimum basic facilities are included in the project to assure sustained benefits. Total annual benefits accruing to recreation are estimated to be $92,250.

Secondary benefits from a national viewpoint were not considered pertinent to the economic evaluation. Local secondary benefits amounting to $105,061 were used in the justification of this project. Of these benefits, $31,263 stem from the project and the remaining $73,798 are induced by the project. The project will provide other benefits from the increased economic activity within the watershed and neighboring towns. Benefits will also accrue from the greater sense of economic security obtained by the people in the watershed. These benefits are not considered in the justification of the project.

COMPARISON OF BENEFITS AND COSTS

Average annual primary benefits from structural measures are estimated to be $312,632. The average annual cost of structural measures (amortized installation cost plus operation, maintenance, and replacement) is estimated to be $207,319, providing a benefit-cost ratio of 1.5:1.

Total benefits, including secondary benefits, are estimated to be $417,693, providing a benefit-cost ratio of 2.0:1.

PROJECT INSTALLATION

Federal assistance for carrying out the works of improvement described in this work plan will be provided under authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress; 68 Stat. 666), as amended.

Land Treatment Measures

Land treatment measures, as shown under works of improvement to be installed, will be established by the landowners and operators in cooperation with the Lower West Red River Soil and Water Conservation District and the Louisiana Forestry Commission in cooperation with the United States Forest Service, during the 10-year installation period. The cost of applying these measures, except for reimbursements from the Agricultural Stabilization and Conservation Service or other federal programs, will be borne by the owners and operators of the land. The district, with assistance from the Soil Conservation Service, is presently giving assistance to farmers and ranchers in the planning and application of the needed land treatment measures. Accelerated technical assistance, as indicated in table 1, is necessary to help landowners develop farm and ranch plans, to provide needed soil surveys, and to assist in planning

and applying land treatment measures.

The Louisiana Forestry Commission, in cooperation with the U. S. Forest Service, will assign a forester trained in watershed management to this project for 8 man-months during the project installation period. He will provide private landowners with technical assistance to install forestry measures.

Accelerated technical assistance amounting to $82,285 (table 1) will be provided. The installation of these land treatment measures is expected to be accomplished in 10 years. Needed accelerated technical assistance will increase annually to a peak which is expected to occur during the third or fourth year of the period.

No accelerated funds will be provided through Public Law 566 for the installation of land treatment measures on national forest land. The completion of these measures will depend on availability of appropriated funds for these line items and as may be allotted to the Kisatchie National Forest on the basis of established inventory and work plans of critical area priortiy needs, considering all the national forests.

Structural Measures

The Rapides Parish Police Jury will pay the local share of the installation cost of structural measures; let and service the contracts; arrange for all road, bridge, and utility changes; and secure all needed land, easements, and rights-of-way.

Construction of the structural measures will be started as soon as (1) the project is approved; (2) the parish is prepared to discharge its responsibilities; (3) local and federal funds are available; and (4) the necessary land, easements, rights-of-way, and maintenance agreements are obtained.

The Soil Conservation Service will (1) share in the cost of structural measures; (2) provide engineering services for the construction of the multiple-purpose Reservoir No.1, the 3 water control structures in Bayou Boeuf, the water control structure in Bayou Robert, and the irrigation canal; and (3) provide assistance as available in preparing plans and specifications for the recreational facility. Where private engineering and architectural services are required for the installation of the recreational facility, the Soil Conservation Service will share up to 50 percent of the cost actually paid by the Rapides Parish Police Jury for such services.

The U. S. Forest Service, the Louisiana Forestry Commission, and the Louisiana Wild Life and Fisheries Commission will make available to the local sponsors, through a special use permit, lands under their jurisdiction which are needed for the construction of the reservoirs. The local sponsors will enter into an agreement with each land-administering agency for the use of the land.

The Louisiana Department of Public Works will prepare detailed designs and specifications for multiple-purpose Reservoir No. 2 and will provide engineering services necessary for its construction. Reimbursements will be made to the Department from Public Law 566 funds as provided in the Watershed Work Plan Agreement.

The police jury will obtain title to all privately owned lands needed for the construction of structural measures.

FINANCING PROJECT INSTALLATION

The Federal Government will finance its share of the costs of this project as provided under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress; 68 Stat. 666) as amended. Financial and other assistance to be furnished by the Federal Government in carrying out the project is contingent on the appropriation of funds for this purpose.

The Rapides Parish Police Jury is a legally constituted organization under the laws of the State of Louisiana. In order to provide the local share of the funds necessary for the completion of this project, a parish-wide tax has been voted. Negotiations have been started with the Farmers Home Administration for securing a loan for installing works of improvement included in this work plan. The above tax has been collected each year for 5 years and is being held in escrow for this purpose. It is possible that the funds collected will be adequate for the project installation without obtaining a loan; therefore, a loan will actually be negotiated only if necessary. These funds are considered adequate for the local share of the cost of project installation, operation, maintenance, and replacement costs.

The parish Agricultural Stabilization and Conservation Service Committee will cooperate with the governing body of the soil and water conservation district in selecting practices and providing financial assistance for those agricultural conservation program practices which will accomplish the conservation objectives in the shortest possible time. The soil and water conservation loan program of the Farmers Home Administration is available to all eligible farmers in the area.

PROVISIONS FOR OPERATION AND MAINTENANCE

Operation and maintenance of all phases of the completed project will be the responsibility of non-federal groups, agencies and individuals, except that the U. S. Forest Service is responsible for land treatment measures on national forest land.

Land treatment measures will be maintained by landowners or operators of the farms on which the measures are installed under agreement with the Lower West Red River Soil and Water Conservation District. The Louisiana Forestry Commission, in cooperation with the U. S. Forest Service, and the Lower West Red River Soil and Water Conservation District, in cooperation with the Soil Conservation Service, will assume the

responsibility of coordinating this work and will encourage landowners and operators to perform needed maintenance. The U. S. Forest Service is responsible for the maintenance of land treatment measures on national forest lands. The Rapides Parish Police Jury will be responsible for the operation and maintenance of the structural measures and minimum basic facilities. Operation and maintenance cost of structural measures and minimum basic facilities is estimated to be $17,806 annually. Replacement costs are estimated to be $5,507 annually. The parish-wide tax that is already being collected is considered adequate for these costs.

The 2 reservoirs will be operated as multiple-purpose irrigation and recreation structures. Recreation will include fishing, hunting, swimming, boating, and skiing. An operation and maintenance agreement for these reservoirs will be entered into between the Soil Conservation Service and the Rapides Parish Police Jury prior to issuing a contract for the construction of these facilities. This agreement will take into account the multiple use of the stored water and will protect, insofar as possible, both purposes. Water may be withdrawn from the reservoir for necessary management purposes, provided both irrigation and all recreation interests are considered.

The 2 multiple-purpose reservoirs will be inspected at least annually. Items inspected will include, but will not be limited to, mowing of the embankment to eliminate undesirable growth and upkeep and repair of fences and gates to protect the works of improvement from damage by overgrazing. The emergency spillway and embankment will be inspected to insure maintenance of a protective covering of vegetation and to determine if any excessive rilling has occurred. The principal spillway will be inspected to assure the removal of any accumulated debris and to determine repairs or repainting that is needed.

The minimum basic facilities will be inspected at least bi-monthly during the peak use season, May 1 through September 15. These will be jointly inspected at least annually. Items of inspection will include, but will not be limited to, the general condition of all facilities for picnicking, camping, and boat launching ramps; condition of roads, beaches, and parking areas; upkeep of all sanitary facilities; and use of the facilities. The Rapides Parish Police Jury will assign a full time manager to operate and maintain the recreational facilities. Additional part time help will be assigned, as necessary, to adequately provide custodial, policing, sanitation, and safety measures necessary for the continuing enjoyment of the facility by the public.

The 3 water control structures in Bayou Boeuf will be inspected at least annually to determine the need for repair, removal of sediment and debris, weed control, etc.

The water control structure and pumping plant in Bayou Robert will be inspected monthly during the irrigation season, April 15 through September 15, by the Rapides Parish Police Jury. These will be jointly inspected at least annually by representatives of the Soil Conservation Service and the

local sponsors. Items of inspection will include, but will not be limited to, need for debris removal, repainting, sediment removal, weed control, and general repairs.

The irrigation canal will be inspected at least annually. Items of inspection will include, but will not be limited to, vegetative growth, debris and sediment accumulations, and availability of water to landowners. A continuing maintenance program will placed into effect which will provide for the regular removal of deposits of sediment and debris.

The replacement costs are associated with the facilities that will need replacement during the life of the project. These items are considered to be the pumping plant and motor at Bayou Robert and the minimum basic facilities at the recreation area.

The Soil Conservation Service, through the soil and water conservation district, will participate in the operation and maintenance only to the extent of furnishing technical assistance to aid in inspections and furnishing guidance and information necessary for the operation and maintenance program.

Provisions will be made for free access of district, parish, or federal representatives to inspect all structural measures and their appurtenances at any reasonable time.

The sponsoring local organizations fully understand their obligations for maintenance and will execute specific maintenance agreements prior to the issuance of any invitation to bid.

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TABLE 1 - ESTIMATED PROJECT INSTALLATION COST

Bayou Boeuf Watershed, Louisiana

Installation Cost Item	Unit	Number to be Applied			Estimated Cost (Dollars) 1/						
					Public Law 566 Funds			Other Funds			Total
		Non-Federal Land	Federal Land	Total	Non-Federal Land	Federal Land	Total P.L. 566 Funds	Non-Federal Land	Federal Land	Total Other Funds	Installation Cost
LAND TREATMENT											
Soil Conservation Service											
Cropland	Acre	29,204	-	29,204	-	-	-	931,605	-	931,605	931,605
Grassland	Acre	32,253	-	32,253	-	-	-	956,391	-	956,391	956,391
Technical Assistance		-	-	-	78,535	-	78,535	75,667	-	75,667	154,202
Subtotal - SCS		61,457	-	61,457	78,535	-	78,535	1,963,663	-	1,963,663	2,042,198
Forest Service											
Forest Land	Acre	2,100	27,746	29,846	-	-	-	14,250	250,960	265,210	265,210
Technical Assistance		-	-	-	3,750	-	3,750	2,600	-	2,600	6,350
Subtotal - FS		2,100	27,746	29,846	3,750	-	3,750	16,850	250,960	267,810	271,560
TOTAL LAND TREATMENT		63,557	27,746	91,303	82,285	-	82,285	1,980,513	250,960	2,231,473	2,313,758
STRUCTURAL MEASURES											
Soil Conservation Service											
Water Control Structure (Bayou Boeuf)	Each	3	-	3	83,030	-	83,030	83,030	-	83,030	166,060
Multiple-Purpose Reservoir	Each	2	-	2	1,569,150	-	1,569,150	1,569,150	-	1,569,150	3,138,300 2/
Irrigation Canal	Mile	10.6	-	10.6	74,600	-	74,600	74,600	-	74,600	149,200
Minimum Basic Facilities	Unit	1	-	1	145,345	-	145,345	145,345	-	145,345	290,690
Water Control Structure (Bayou Robert)	Each	1	-	1	31,515	-	31,515	31,515	-	31,515	63,030
Clearing and Snagging	Foot	73,100	-	73,100	31,020	-	31,020	31,020	-	31,020	62,040
Subtotal - Construction					1,934,660	-	1,934,660	1,934,660	-	1,934,660	3,869,320
Installation Services											
Engineering Services					900,431	-	900,431	47,553	-	47,553	947,984
Other					317,951	-	317,951	-	-	-	317,951
Subtotal - Installation Services					1,218,382	-	1,218,382	47,553	-	47,553	1,265,935
Other Costs											
Land, Easements, and Rights-of-Way					-	-	-	332,880	33,393 3/	366,273	366,273
Legal Fees, Surveys, Appraisals, Use Permits, etc.					-	-	-	44,830	6,100 4/	50,930	50,930
Contract Administration & Project Promotion					-	-	-	64,000	-	64,000	64,000
Subtotal - Other Costs					-	-	-	441,710	39,493	481,203	481,203
TOTAL STRUCTURAL MEASURES					3,153,042	-	3,153,042	2,423,923	39,493	2,463,416	5,616,458
TOTAL PROJECT INSTALLATION					3,235,327	-	3,235,327	4,404,436	290,453	4,694,889	7,930,216

1/ Price Base: 1964.
2/ Includes cost of clearing.
3/ Modification of road and bridge on national forest land.
4/ Reference land corners on national forest land.

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TABLE 1A - STATUS OF WATERSHED WORKS OF IMPROVEMENT
(At Time of Work Plan Preparation)

Bayou Boeuf Watershed, Louisiana

Measure	Unit	Number Applied To Date	Total Cost (Dollars) 1/
LAND TREATMENT			
Chiseling	Acre	2,000	5,500
Conservation Cropping System	Acre	15,000	90,000
Crop Residue Use	Acre	19,000	133,000
Drainage Field Ditches	Foot	170,000	8,500
Grass and Legumes in Rotation	Acre	800	105,600
Irrigation Water Management	Acre	300	1,800
Land Smoothing	Acre	200	50,400
Pasture and Hayland Renovation	Acre	300	6,600
Pasture Planting	Acre	4,250	114,750
Pasture Proper Use	Acre	10,000	60,000
Rotation Grazing	Acre	8,200	49,200
Bedding	Acre	700	28,700
Woodland Proper Grazing	Acre	17,000	20,400
Tree Planting	Acre	4,720	77,280
Woodland Weeding	Acre	9,470	84,800
Woodland Harvest Cutting	Acre	4,800	7,200
Woodland Intermediate Cutting	Acre	40,050	60,075
Forest Land Conversion	Acre	8,750	96,250
STRUCTURAL MEASURES			
Drainage Mains and Laterals	Foot	420,000	100,800
Grade Stabilization Structure	Number	40	2,400
Irrigation Canal	Foot	10,000	6,000
Irrigation Pipeline	Foot	50	200
Irrigation System	Number	1	2,000
Structure for Water Control	Number	3	180
Irrigation Land Grading	Acre	400	22,000
TOTAL	xxxx	xxxx	1,133,635

1/ Price Base: 1964.

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TABLE 2 - ESTIMATED STRUCTURAL COST DISTRIBUTION

Bayou Boeuf Watershed, Louisiana

(Dollars) 1/

Structure Type	Installation Cost - Public Law 566 Funds				Installation Cost - Other Funds					
		Installation Services					Other			
	Construction	Engineering	Other	Total Public Law 566 Funds	Construction	Installation Services	Administration of Contracts	Land Easements & R/W	Total Other Funds	Total Installation Cost
Multiple-Purpose Reservoir No. 1	946,000	463,540	155,466	1,565,006	946,000	-	22,000	114,893	1,082,893	2,647,899
Multiple-Purpose Reservoir No. 2	623,150	305,344	102,409	1,030,903	623,150	-	22,000	225,000	870,150	1,901,053
Water Control Structures (3) (Bayou Boeuf)	83,030	40,680	13,650	137,360	83,030	-	500	300	83,830	221,190
Water Control Structure (1) (Bayou Robert)	31,515	15,450	5,180	52,145	31,515	-	500	200	32,215	84,360
Irrigation Canal	74,600	36,550	12,260	123,410	74,600	-	7,000	42,730	124,330	247,740
Minimum Basic Facility	145,345	23,667	23,886	192,898	145,345	47,553	11,000	19,500	223,398	416,296
Clearing and Snagging	31,020	15,200	5,100	51,320	31,020	-	1,000	14,580	46,600	97,920
GRAND TOTAL	1,934,660	900,431	317,951	3,153,042	1,934,660	47,553	64,000	417,203	2,463,416	5,616,458

1/ Price Base: 1964.

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TABLE 2A - COST ALLOCATION AND COST-SHARING SUMMARY

Bayou Boeuf Watershed, Louisiana
(Dollars) 1/

Item	Purpose: Agri. Water Management	Purpose: Recreation	Total
	COST ALLOCATION		
Single-Purpose			
Water Control Structures (3) - Bayou Boeuf	221,190	-	221,190
Water Control Structure (1) - Bayou Robert	84,360	-	84,360
Irrigation Canal	247,740	-	247,740
Minimum Basic Facilities	-	416,296	416,296
Clearing and Snagging	97,920	-	97,920
Multiple-Purpose			
Reservoir No. 1	2,171,277	476,622	2,647,899
Reservoir No. 2	1,387,770	513,283	1,901,053
TOTAL	4,210,257	1,406,201	5,616,458
	COST SHARING		
Public Law 566	2,400,101	752,941	3,153,042
Other	1,810,156	653,260	2,463,416
TOTAL	4,210,257	1,406,201	5,616,458

1/ Price Base: 1964.

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TABLE 2B - RECREATION FACILITIES COST ESTIMATE

BAYOU BOEUF RESERVOIR NO. 2

Bayou Boeuf Watershed, Louisiana

Item Description	Unit	Quantity	Unit Cost (dollars)	Total (dollars)
Picnic Site Units 2 Picnic Tables 2 Parking Stalls 1 Grill Fireplace	Each	30	680	20,400
Camp Site Units 1 Picnic Table 1 Parking Stall 1 Grill Fireplace 1 Tent or Trailer Site	Each	30	495	14,850
Toilet Facilities				
2-Unit Chemical Type (4 Bowls)	Each	3	1,500	4,500
4-Unit Flush Type (8 Bowls and 4 Lavatories)	Each	1	7,500	7,500
4-Unit Flush Type (8 Bowls, 4 Lavatories, 8 Showers)	Each	2	11,500	23,000
Water Well	Each	1	10,000	10,000
Water Lines	Foot	12,000	2.50	30,000
Drinking Fountains	Each	40	100	4,000
Boat Launching Ramp	Each	1	9,000	9,000
Wharf (Timber on Floats)	Foot	100	70	7,000
Shore Line Beach (4 Acres)	Each	1	14,000	14,000
Shelters	Each	3	3,000	9,000
Fence (Hog Proof)	Foot	5,300	0.55	2,910
Land Clearing				
Recreation Development	Acre	45	250	11,250
Boat Lanes	Acre	20	600	12,000
Asphalt Roads (Access & Service)				
Double Lane	Foot	7,200	4.50	32,400
Single Lane	Foot	8,000	2.50	20,000
Location & Directional Signals	Each	60	3	180
Entrance Signs	Each	2	50	100
Safety Markers	Each	11	50	550
Parking Stalls				
Beach Lot	Each	100	60	6,000
Boat Launching Lot	Each	40	60	2,400
Camping Comfort Station	Each	15	60	900
Southern Shelter	Each	5	60	300
Total	xxxx	xxxx	xxxx	242,240
20 Percent Contingency				48,450
GRAND TOTAL				290,690

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TABLE 3 - STRUCTURE DATA - WATER SUPPLY RESERVOIRS

Bayou Boeuf Watershed, Louisiana

Item	Unit	Structure Number 1	Structure Number 2
Drainage Area	Sq.Mi.	34.9	23.5
Storage Capacity			
Sediment	Ac.Ft.	880	570
Recreation	Ac.Ft.	4,310	6,550
Irrigation	Ac.Ft.	19,810	17,880
Total	Ac.Ft.	25,000	25,000
Surface Area			
Sediment Pool	Acre	925	160
Recreation Pool	Acre	1,290	1,125
Irrigation Pool	Acre	1,920	2,250
Volume of Fill	Cu.Yd.	407,800	420,000
Elevation Top of Dam (Settled)	Ft.MSL	104.6	95.8
Maximum Height of Dam (Settled)	Ft.	29	30
Spillways			
Concrete			
Crest Elevation	Ft.MSL	94.7	86.5
Bottom Width	Ft.	125	80
Vegetated			
Crest Elevation	Ft.MSL	99.6	- 2/
Bottom Width	Ft.	400	-
Average Curve No. - Cond. II	No.	67	70
Emergency Spillway Hydrograph			
Storm Rainfall (6-hr)	In.	12.2	13.3
Storm Runoff	In.	7.8	9.2
Velocity of Flow (Vc)	Ft./Sec.	6.7 1/	-
Discharge Rate	CFS	4,120 1/	2,530
Maximum Water Surface Elevation	Ft.MSL	99.6	90.7
Freeboard Hydrograph			
Storm Rainfall (6-hr)	In.	25.2	27.4
Storm Runoff	In.	20.1	22.9
Velocity of Flow (Vc)	Ft./Sec.	9.5 3/	-
Discharge Rate	CFS	24,250 4/	7,750
Maximum Water Surface Elevation	Ft.MSL	104.6	95
Capacity Equivalents			
Sediment Volume	In.	0.52	0.47
Recreation Volume	In.	2.32	5.12
Irrigation Volume	In.	10.66	14.34
Spillway Storage (Design Storm)	In.	5.43	8.09
Class of Structure		B	B

1/ Flow through concrete chute spillway only. No emergency spillway flow.

2/ No vegetated earthen spillway.

3/ Vc through vegetated earthen spillway (emergency).

4/ Q through both spillways.

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TABLE 3A - STRUCTURE DATA - CHANNELS

Bayou Boeuf Watershed, Louisiana

Channel Designation	Station	Watershed Area: Irrigation	Watershed Area: Drainage	Required Channel Capacity: Irrigation	Required Channel Capacity: Drainage	Planned Channel Capacity: Irrigation	Planned Channel Capacity: Drainage	Bottom Width: Irrigation	Side Slopes	Planned Depth: Irrigation	Fall	Maximum Velocity at Design Depth: Irrigation	Volume of Excavation: Irrigation
	(feet)	(acres)	(acres)	(c.f.s.)	(c.f.s.)	(c.f.s.)	(c.f.s.)	(feet)	(feet)	(feet)	(feet)	(f.p.s.)	(cu.yds.)
Bayou Robert	2300+00	3,300	4,500	41.7	235	41.8	253	16	2:1	4.1	0.00005	0.5	266,600
	2840+00		2,200		128	41.8	128	16	2:1	4.1	0.00005	0.5	
Bayou Boeuf above Weir No. 3	964+00 to 1695+00			191		191		Clearing & Grubbing (171 Acres)					

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TABLE 3B - STRUCTURE DATA - WATER CONTROL STRUCTURES

Bayou Boeuf Watershed, Louisiana

Site Number	Type	Design Flow (c.f.s.)	Earth Fill (cu.yds.)	Concrete Volume (cu.yds.)	Dimensions of Inlet Width (feet)	Dimensions of Inlet Length (feet)	Depth (feet)	Excavation (cu.yds.)
1	Low-Level Weir Box Inlet	820	22,600	239	20	10	7.5	19,200
2	Low-Level Weir Box Inlet	820	31,700	237	20	10	7.6	27,000
3	Low-Level Weir Box Inlet	820	19,300	240	20	10	8.8	16,700
4	Earth Fill	310	3,500	0	60" CMP With Slide Gate			0

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TABLE 4 - ANNUAL COST

Bayou Boeuf Watershed, Louisiana

(Dollars)

Evaluation Unit	Amortization of Installation Cost 1/	Operation and Maintenance Cost 2/	Replacement Cost 2/	Total
Water Control Structures - Bayou Boeuf (3)	7,246	520	-	7,766
Multiple-Purpose Reservoirs	149,024	1,802	-	150,826
Irrigation Canal	8,116	1,056	-	9,172
Minimum Basic Facilities	13,638	10,392	4,270 3/	28,300
Water Control Structures - Bayou Robert (1)	2,764	4,036	1,237 4/	8,037
Clearing and Snagging	3,208	- 5/		3,208
TOTAL	183,996	17,806	5,507	207,319

1/ Price Base: 1964, amortized for 100 years at 3-1/8 percent interest.

2/ Long-term prices as projected by ARS, September 1957.

3/ Replacement costs for short life expectancy facilities.

4/ Replacement costs for pump and house.

5/ Included in present maintenance program.

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TABLE 5 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Bayou Boeuf Watershed, Louisiana

(Dollars) 1/

Evaluation Unit	Average Annual Benefits				Average Annual Cost 2/	Benefit-Cost Ratio
	Agricultural Water Management Irrigation	Recreation	Secondary	Total		
Structural Measures	220,382	92,250	105,061	417,693	207,319	2.0:1
GRAND TOTAL	220,382	92,250	105,061	417,693	207,319	2.0:1

1/ Price Base: 1964.

2/ Long-term prices as projected by ARS, September 1964.

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INVESTIGATIONS AND ANALYSES

Cover Conditions and Land Use

The soil cover determinations were made from existing Soil Conservation Service work unit records, soil surveys, and field inspections. Additional information to verify soil cover conditions was obtained from detailed studies of the watershed.

The land use on the watershed was determined from existing Soil Conservation Service work unit records and from field reconnaissance studies.

Land Use and Treatment Needs

Records of accomplishments, tabulations of conservation needs, field surveys, and information from the work unit of the Soil Conservation Service, U. S. Forest Service, and other federal, state, and local agricultural offices were used to determine the probable land uses and treatment to be expected under going programs. Although some benefits would result from application of these land treatment measures, it was apparent that structural measures would be needed to attain the total benefits desired.

Structural Measures

Structural measures which would be feasible to install were determined. The study made and the procedures used in that determination were as follows.

1. The sponsoring local organizations requested that consideration be given to the construction of multiple-purpose storage reservoirs on Valentine Creek and on Indian Creek for the purpose of storing water for irrigation and recreation. They also requested that a recreational area be installed adjacent to the Indian Creek site.

2. A base map was prepared from U. S. Geological Survey quadrangle sheets showing the watershed boundary, drainage pattern, system of roads, and other pertinent data. A stereoscopic study of aerial photographs and a study of topographic maps were made to locate probable water storage sites. The 2 sites requested by the local sponsors were included.

3. A field examination was made of all probable water storage sites previously located. Sites which did not show good storage possibilities or which, for other reasons, would not be economically feasible, were dropped from further consideration.

4. A preliminary determination of the amount of water storage needed was made. It was determined that the 2 sites requested by the local people would provide the necessary amount of storage at the lowest cost.

5. The economic feasibility of these sites was determined by estimating the benefits to be determined (see Economic Investigations) and the cost of the measures necessary to insure the realization of these benefits.

Engineering Investigations

1. All probable reservoir sites were located on topographic maps. A field reconnaissance was made to eliminate those sites which did not show good storage characteristics. The 2 sites selected for detailed studies were selected on the basis of (a) their high potential as water storage sites, (b) their geographical location which would best accomplish the goals of the project, and (c) the desire of the local people to utilize these sites.

2. Detailed surveys were made of these 2 sites by the Soil Conservation Service and the Louisiana Department of Public Works. Topographic maps were made of the areas to determine the storage capacity, the height of the dams necessary to effect the required storage, the volume of the embankments, the location of the spillways, the estimated cost of the structures, and the area to be inundated by each of the pools.

3. A topographic map of the recreational area adjacent to Site No. 2 was prepared in order to formulate feasible minimum basic facilities for recreation.

4. Cross sections were taken along Bayou Boeuf and Bayou Robert as necessary to adequately estimate the cost of channel improvement necessary to deliver irrigation water to the land to be irrigated.

5. Cost estimates were prepared using sound engineering judgment and preliminary geologic information based on Soil Mechanics Laboratory recommendations. When alternate routes or methods were available, all routes were investigated and the most feasible plan was used.

Hydraulic and Hydrologic Investigations

1. Rainfall data for 51 years at Weather Bureau Stations in Alexandria and runoff data for 10 years at Hemphill Creek was compiled for use in reservoir operation studies. Each of these stations is sufficiently close to the watershed that the information was considered reliable.

2. Available data on soils and land use and conditions in the watershed of each reservoir was analyzed. The information used included a survey by the U. S. Forest Service of the forest lands in the watershed. Forest lands comprise about 95 percent of the areas draining into each of the reservoirs.

3. The spillway designs for the 2 reservoirs were planned in the following manner. (a) A concrete spillway will be constructed

for Site No. 1 which will be designed to carry the peak outflow from a 6-hour storm producing a maximum point rainfall of 15 inches. An earth spillway will be provided which will be proportioned to prevent overtopping of the dam from a 6-hour storm producing a maximum point rainfall of 31 inches. (b) A single concrete spillway will be provided on Site No. 2 which will prevent overtopping of the dam from a 6-hour storm producing a maximum point rainfall of 31 inches. The U. S. Weather Bureau estimates that the probable maximum possible 6-hour rainfall in the vicinity is 31.5 inches. A suitable emergency earthern spillway site was not available.

4. The requirement for release capacities of the 2 reservoirs was based on normal base flow and maximum pumping rates for those crops to be irrigated during the peak demand period. The maximum pumping rate was adjusted for efficiency, expected participation, and expected duration of daily pumpage. With release from Site No. 1 alone, the required maximum release rate is 315 c.f.s. With release from Site No. 2 alone, the required maximum release rate is 293 c.f.s.

5. Release flows from Reservoir No. 1 will enter into a channel that is authorized for construction as part of the Corps of Engineers' Bayou Cocodrie and Tributaries Project and referred to as the Bayous Rapides-Boeuf-Cocodrie Diversion Canal, Kincaid-to-Cloverdale lateral. It is designed to carry flows considerably larger than the combined irrigation flow and base flow. The drainage channel flows through 15 miles of Red River back swamp deposits of heavy clays with small, localized lenses of coarser material. Several perennial flow tributaries enter the channel at various points. No significant increase in transmission losses is anticipated.

Bayou Boeuf has already been improved from Cloverdale to Lecompte, and the capacity is far in excess of the required irrigation flow.

The control structure planned at the mouth of Bayou Robert was designed to release 235 c.f.s. drainage flow into Bayou Boeuf.

Channel cross sections at intervals of approximately 2,000 feet on Bayou Boeuf below Lecompte and on Bayou Robert were studied for hydraulic design and evaluation. The Bayou Robert channel was found to be inadequate to supply the required irrigation pumpage. An excavated channel was designed to carry the required 42 c.f.s. irrigation flow based on maximum pumping rates adjusted for efficiency, expected participation, and expected duration of daily pumpage. The designed channel has adequate sump storage to offset peak daytime pumpage.

Channel capacities of Bayou Boeuf downstream from Lecompte were investigated under various conditions by Doubt's method of water surface profiles computations. The channel will require clearing and snagging in the reach between Lecompte and the upper weir

(water control structure No. 3) to carry required drainage flow or irrigation flow. The channel does not have adequate sump storage in all reaches. The location of the upper weir is such that the channel upstream from it must be improved in order to carry the required irrigation flow.

6. In the reservoir operations studies, frequency occurrence of annual and monthly runoff amounts was determined from Weather Bureau and Geological Survey records. Rainfall amounts at the Alexandria rain gages were correlated with runoff amounts of the stream gage on Hemphill Creek near Hot Wells.

   Monthly evaporation rates were determined from Weather Bureau data on lake evaporation for 1954, a severe drouth year.

   Monthly irrigation demands were developed on a frequency basis. Net irrigation requirements were computed by taking into account soils and cropping patterns in the benefit area and using information contained in Table A of ARS Technical Bulletin No. 1209. 1/

Sedimentation Investigations

Sediment storage for the 2 reservoirs was computed in accordance with land use and the erosion rate established for Bayou Rapides Watershed (the adjoining watershed).

The primary source of sediment was considered to be from sheet erosion, with less than 0.4 percent of the total sediment being derived from stream-bank erosion. All other sources of sediment were considered to be negligible. The estimated erosion rate amounted to approximately 1.7 tons per acre per year and a delivery factor of approximately 35 percent, based on a publication dated August 1962, entitled "Suggested Criteria for Estimating Gross Sheet Erosion and Sediment Delivery Rates for the Blackland Prairies Problem Area in Soil Conservation," published by the Soil Conservation Service. In compliance with SCS Louisiana Watersheds Memorandum 201, sediment was allocated between the irrigation, recreation, and sediment pools. Since the irrigation pool will, at periodic intervals, be emptied, the sediment allocated to this pool was deemed to be aerated and its volume adjusted accordingly.

Geologic Investigations

A relatively intense preliminary investigation, including augering, permeability tests, and undisturbed sampling, was conducted on Site No. 1. This site has very sandy material at shallow depths adjacent to the dam and extending a short distance into the floodplain. A preliminary investigation of sufficient detail to determine the adequacy of the site for storage of permanent water was considered necessary. The preliminary

1/ "Drought and Water Surplus in Agricultural Soils of the Lower Mississippi Valley Area."

design of the dam is based on the results of these tests.

Many subsurface conditions at Site No. 2 are the same as those found at Site No. 1. Data obtained in the preliminary investigations at Site No. 1 was used to estimate cost and prepare the plan for Site No. 2. A series of holes were drilled along the centerline of Site No. 2 to assist in determining the suitability of the site. These holes were used to determine the similarity of the 2 sites.

Seven holes were drilled at 1,000-foot intervals along the centerline of the diversion channel. These holes encountered a CL material at or near the surface, and the channel will bottom in CL material throughout the greater portion of its length.

Bayou Boeuf Watershed lies in the Southern Coastal Plain and the Southern Mississippi Valley Alluvium Land Resource Areas. The controlled drainage area is composed of clays, sands, and silts of the Terrace Deposits of the Pleistocene Series. Soils below the dams are Recent Alluvium.

Both of the dams have multiple-purpose storage and will require abutment drains and possibly an impermeable clay blanket on one or more abutments. Foundation strength below 15 feet is adequate, but additional drilling and testing are required on both sites to effectively determine shallower foundation conditions.

Economic Investigations

Information was obtained from landowners and operators, agricultural workers, and processors relative to average yields under present and future conditions with irrigation. Approximately 90 landowners were interviewed to obtain this information.

Soil Units 8 and 4 were the only soil units that were considered for economically feasible irrigation. Associated costs of delivering water to Soil Unit 3 from the planned system made this soil unit uneconomical to irrigate.

From information obtained by schedules and interviews, a basic yield table was prepared giving yields for without and with project conditions by soil groups, sizes of farms, and trends in the watershed. Production costs for both with and without project conditions were associated. The difference between operating margins with and without was considered to be benefits to project.

Discounts in the form of associated costs, lag in accrual of full level of benefits, degree of participation, and percent chance of available water were deducted from these benefits to provide a net benefit to project. All net benefits are to intensification.

In evaluating recreation benefits, the population trends and trends in demand for recreation were analyzed. Similar facilities on 8 lakes in Louisiana were used in projecting use-days per surface acre of water by

activity. These were considered sufficiently accurate for use in this project. Average annual visitor-days were associated to each of the structures by activity from these projections. A value of $1.50 per visitor-day was associated with the reservoir where minimum basic facilities were provided, and a value of $.50 per visitor-day was associated with the reservoir where no facilities were provided. Evaluation showed that minimum basic facilities should be provided for 1,275 visitors during peak visitor-days.

The analysis of secondary benefits was based on primary benefits stemming from the project and with increased costs of producing the additional goods induced by the project, as well as operation and maintenance costs induced by the project. A factor of 10 percent was used in each case, as set forth in Watersheds Memorandum SCS-57.

Project installation costs were amortized for 100 years at 3-1/8 percent interest. Operation and maintenance were developed for each individual structural measure from similar work in the area. Replacement costs were assigned where necessary to assure a 100-year life of the project. All operation and maintenance costs were reduced to an average annual and converted to long-term prices as projected by ARS, September 1957.

Land, easements, and rights-of-way were determined by consultation with representatives of the United States Forest Service, Louisiana Forestry Commission, appraisals from an adjoining watershed, and local landowners. Appraised value of the land was equal to or exceeded the present productivity of the land.

The following data has been developed for the watershed.

1. Yields and production costs for various crops grown.

2. Land use and production for soil groups under future conditions without and with project conditions.

3. A summation of all soil groups that could economically benefit from the project.

4. Population and economic development trends.

5. Use by visitor-days by activity for the 2 multiple-purpose reservoirs.

6. Minimum basic facilities to be provided for the 1,275 peak use visitors.

7. Discount tables in deriving net benefits.

Forestry Investigations

A systematic field survey showed ground cover, forest and hydrologic conditions, and treatment needs. This survey, supporting data, and

information from other agencies and forestry officials determined the amount of remedial measures. The measures recommended contribute to better runoff characteristics and soil stabilization. The installation period limits the amount of work in the recommended programs.

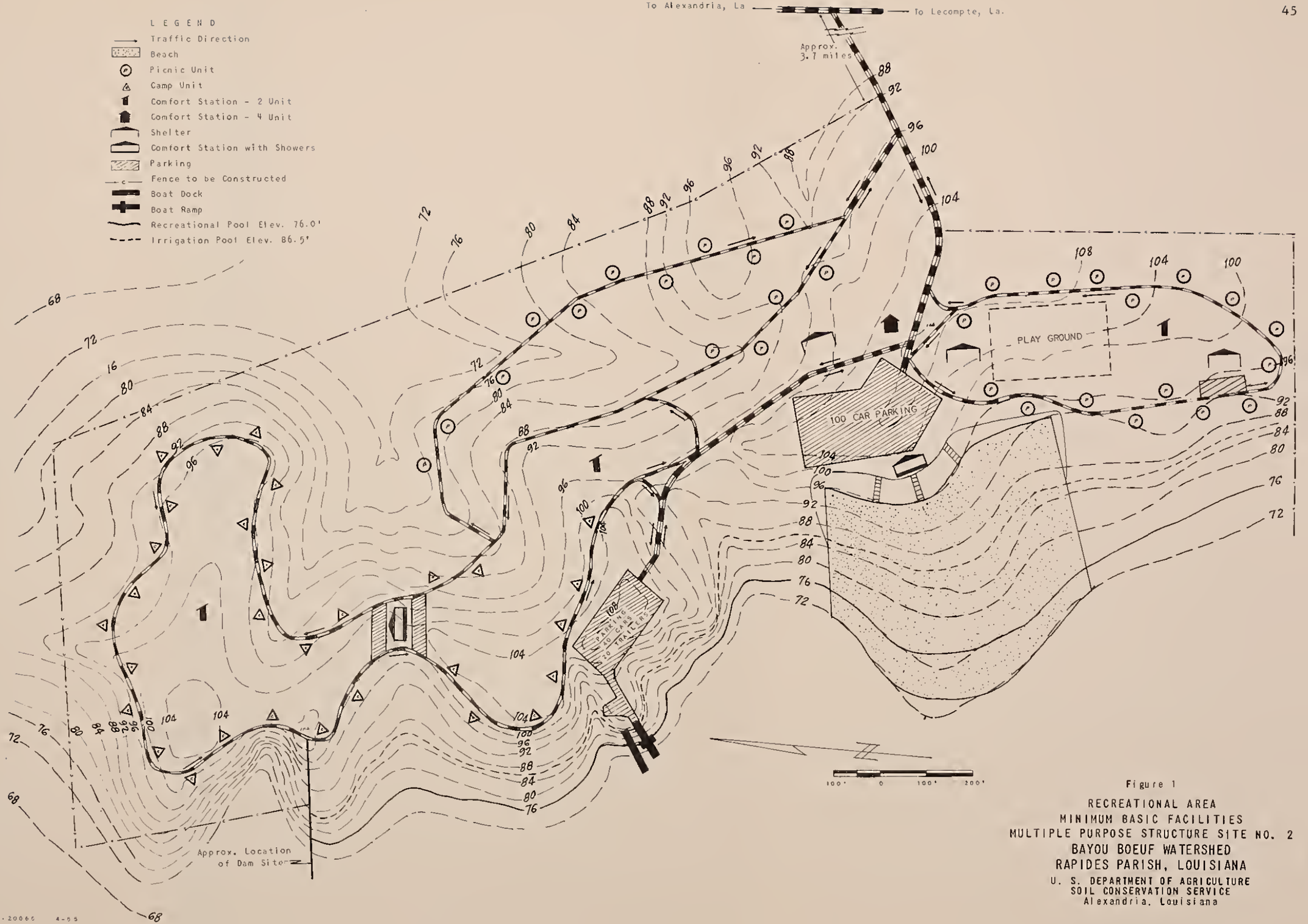

Figure 1

RECREATIONAL AREA
MINIMUM BASIC FACILITIES
MULTIPLE PURPOSE STRUCTURE SITE NO. 2
BAYOU BOEUF WATERSHED
RAPIDES PARISH, LOUISIANA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Alexandria, Louisiana

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USDA-SCS-FORT WORTH, TEX. 1965

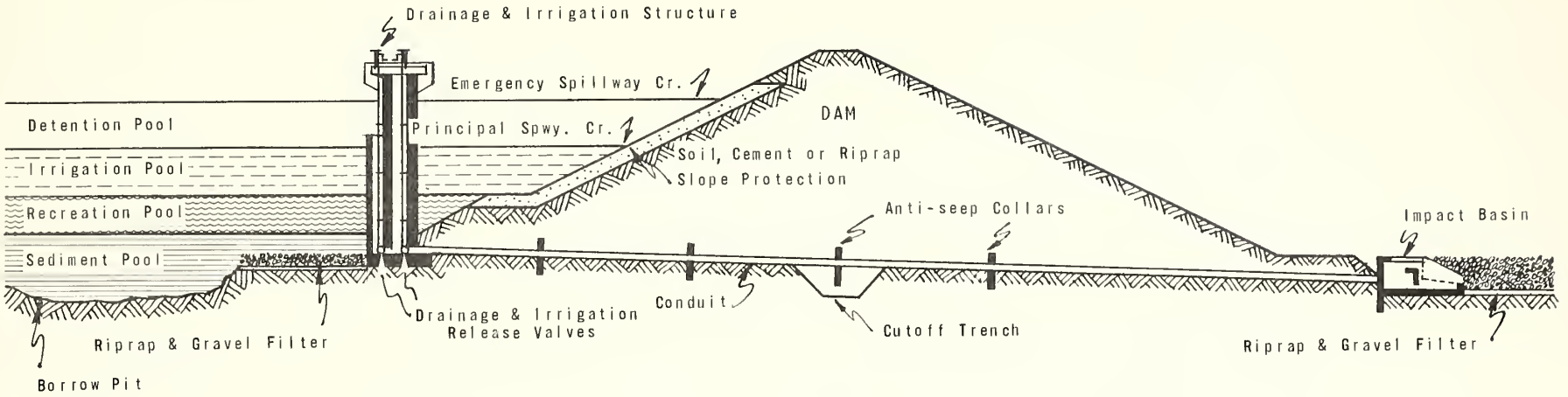

Figure 2

SECTION OF A TYPICAL MULTIPLE PURPOSE STRUCTURE

U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, Alexandria, Louisiana

4-65 4-L-20067

USDA-SCS-FORT WORTH, TEX. 1965

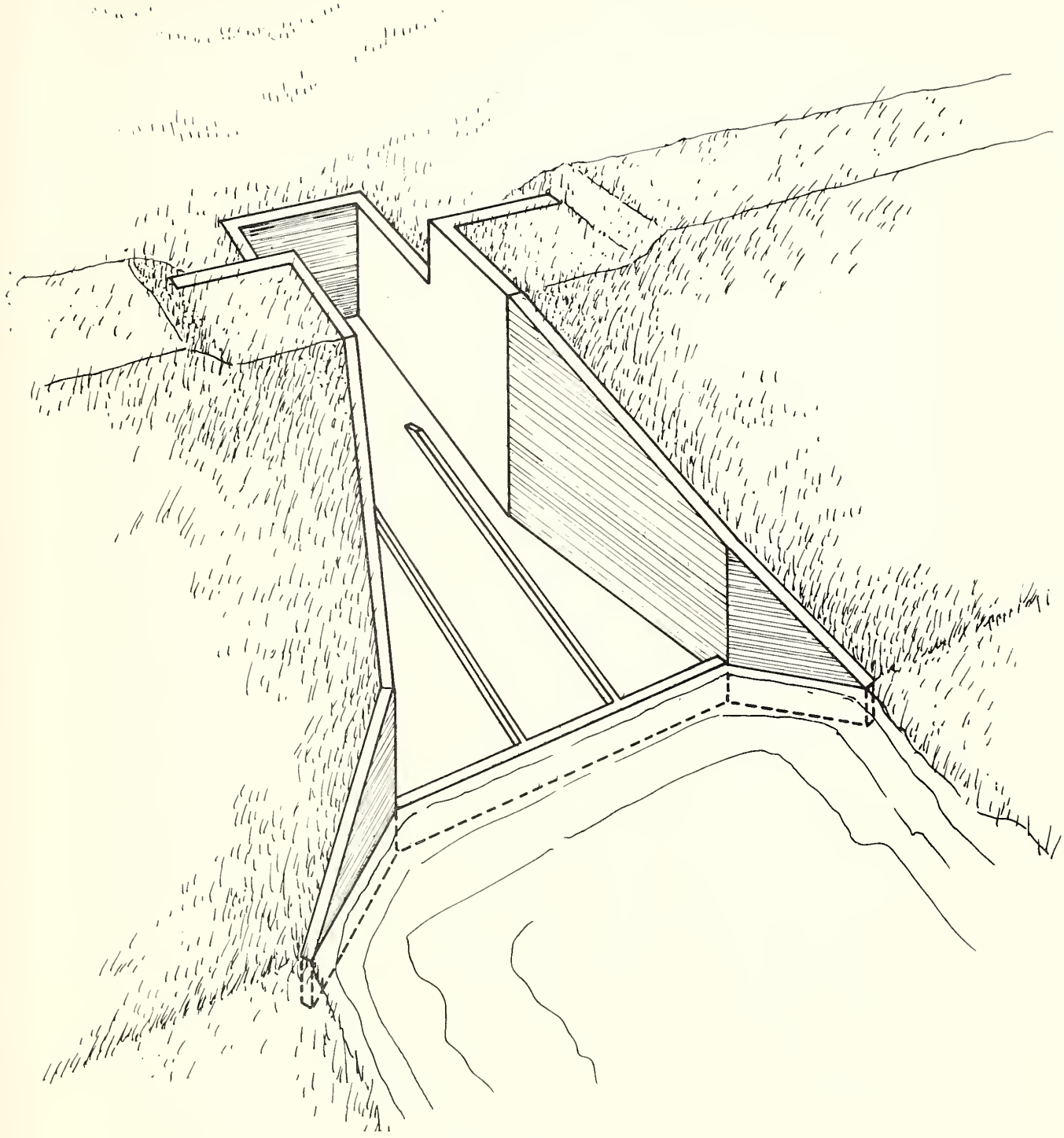

Figure 3

PERSPECTIVE OF WATER CONTROL STRUCTURES 1, 2 AND 3
BAYOU BOEUF WATERSHED
RAPIDES PARISH, LOUISIANA

U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, Alexandria, Louisiana

USDA-SCS-FORT WORTH, TEX. 1965

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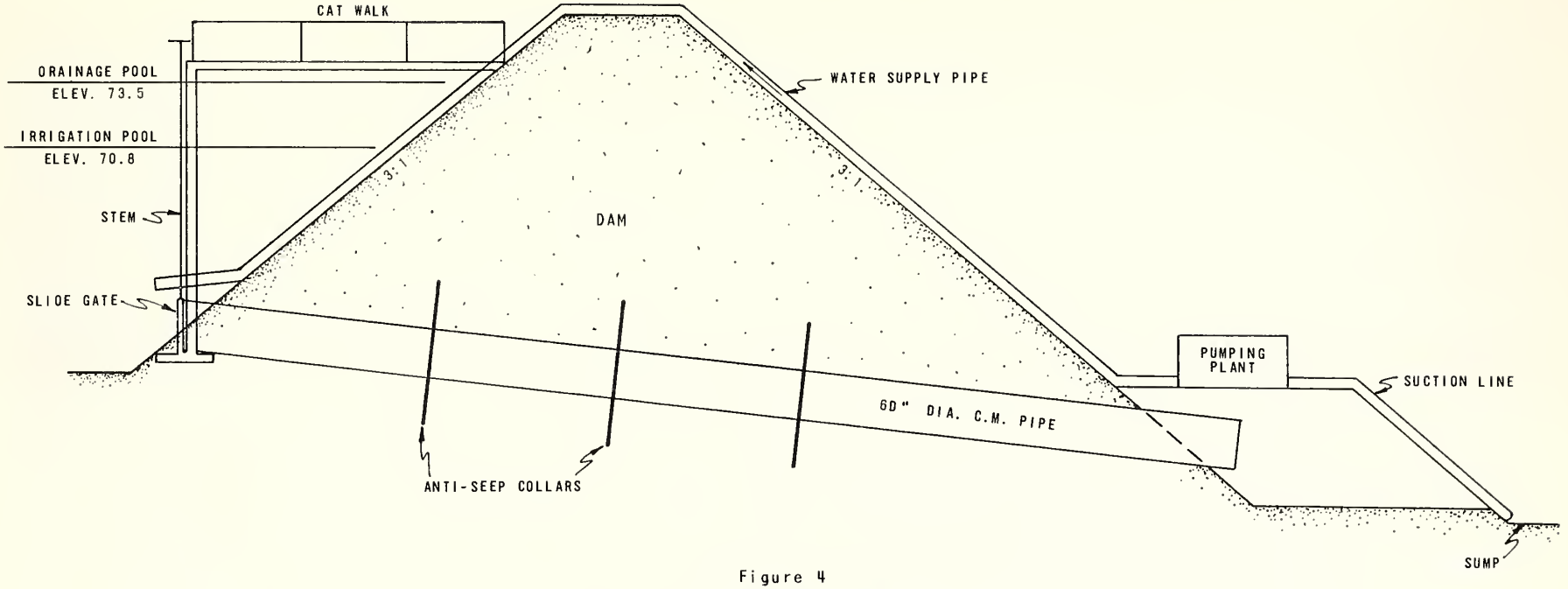


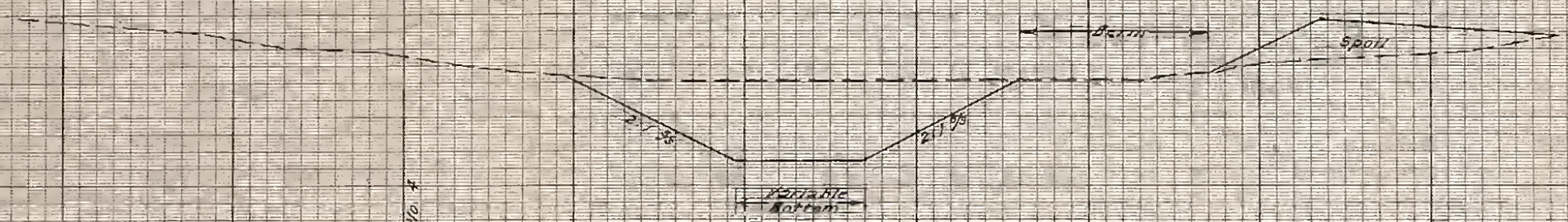
Figure 4

TYPICAL SECTION
WATER CONTROL STRUCTURE NO. 4

BAYOU BOEUF WATERSHED
RAPIDES PARISH, LOUISIANA

U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, Alexandria, Louisiana

TYPICAL CROSS SECTION



CHANNEL PROFILE

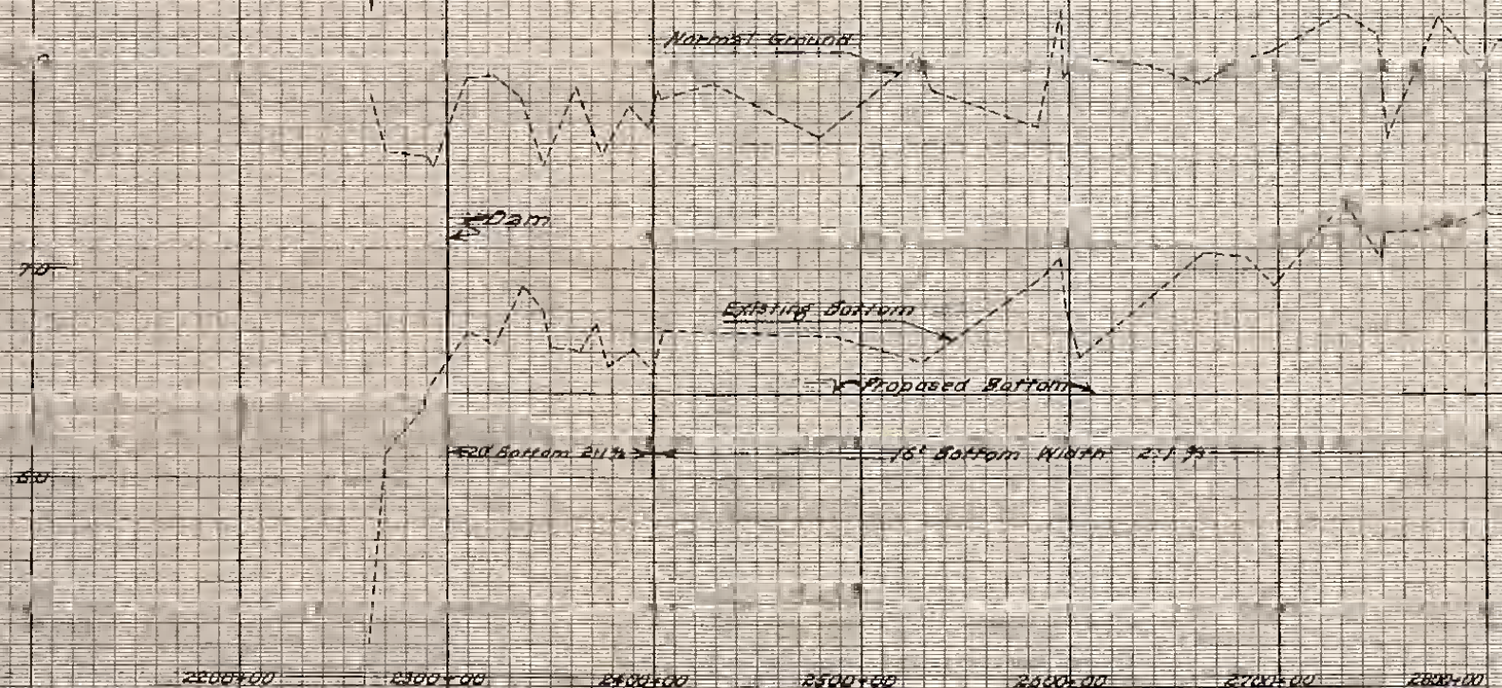


Figure 5
TYPICAL CHANNEL CROSS SECTION AND PROFILE
IRRIGATION CANAL
BAYOU BOEUF WATERSHED
RAPIDES PARISH, LOUISIANA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Date
Designed
Drawn
Traced
Checked
Approved by
Title
Title
Sheet No
of
Drawing No

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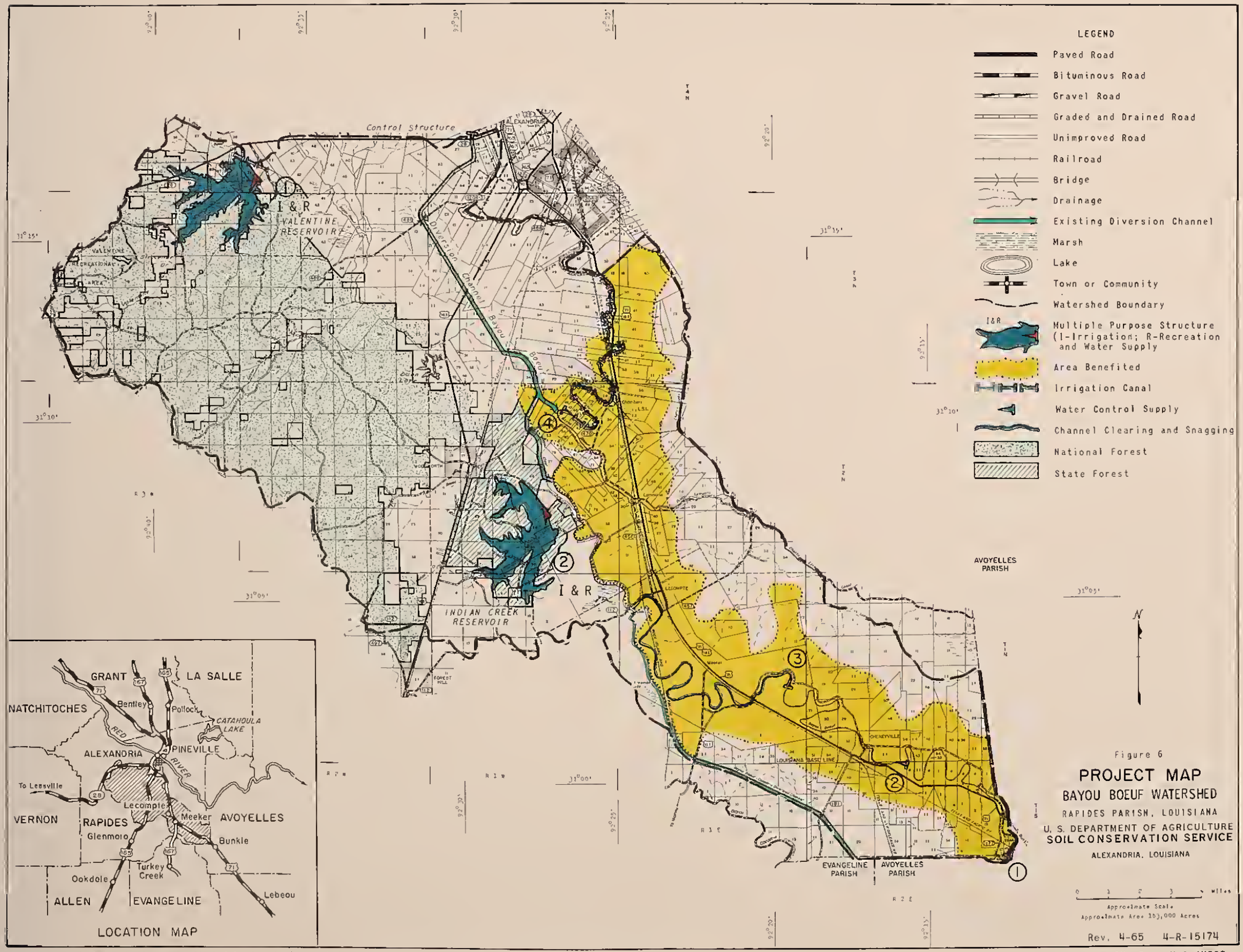

Figure 6

PROJECT MAP

BAYOU BOEUF WATERSHED

RAPIDES PARISH, LOUISIANA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ALEXANDRIA, LOUISIANA

Rev. 4-65 4-R-15174

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